COAL AGE

The Only National Paper Devoted to Coal Mining and Coal Marketing

C. E. LESHER AND R. DAWSON HALL, *Editors.*

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Our Background in Mining

LONG persistence in any line of industry inevitably begets a background from which escape is difficult. Insensibly we fall to thinking that the way established is the only way. Vested interests, laws, labor rules and trade conditions gradually make it increasingly difficult for us to change.

In mining we have fallen heir to the room-and-pillar method. The land owner seeks to retain certain phases of it because with it and a due amount of waste of coal the land can be left intact for farming. The miner likes it because it preserves his individualism. He likes to work where he is not, and cannot be, bossed and controlled. The union questions any change whatsoever because it fears that the results might not be favorable to its interests.

In earlier days there were some advantages in letting every man have his own place, and so be rewarded for his own labors. As soon, however, as the machine came it became disadvantageous to have a working place so small that much of the time was wasted in moving from place to place and in sumping in for a first cut. Conditions were bad enough when we had but one class of machine, a coal cutter. Now we have three machines—cutters, drills and loaders—to make their visits to each place and pass on.

No one knows to what extent the industry has been retarded in its progress by the need for mobility in its machinery. Had the face been continuous, cutters doubtless would have been made larger and better fitted for their work. The same would be true of the loader. A simpler problem, devoid of unloading, loading and transferring difficulties, would have resulted in a more specialized machine with correspondingly greater accomplishments.

The room-and-pillar method has had the further disadvantage of intensifying ventilation and drainage problems. In regard to the latter we may compare open-pit mining with underground. In the surface work a single pump usually suffices; and sometimes not even one is needed. The water runs readily to a single sump or flows away by a natural waterway.

In the regular room-and-pillar method and in the ordinary longwall system we have become so used to the haulage disadvantages of single-car shuttle traffic into rooms that we accept it as being irremediable. So long as the miners provided the power it was not a great burden to the operator, though the making up of trips from cars at the room necks was not as easy as the taking of fully made trips from the coal face would be. When, however, it became necessary to place mine cars at the working face with a locomotive, leave them there to be filled and then go back and get them, the cost proved so great that the operator rebelled, but still he did not feel he could tear himself from his background—the room-and-pillar method.

To get the maximum out of modern equipment a longwall retreating system is necessary. In thick coal, cars can be pulled in trips along the face and loaded as they pass. In thin beds machine loaders and face conveyors can be used, the latter delivering to cars in roads dug into the bottom or brushed into the top. Probably the best way to provide for car delivery would be to place two parallel tracks in each room, just as close as would provide for clearance, with a transfer table or other device at the end of the road on which cars could be moved sidewise from the empty track to the one on which loading is to take place, in this way removing the necessity for frequently moved switches or for great waste of time in switching. Many methods may be suggested but some better plan than has been so far provided unquestionably must be found.

Trend Discernible in Hoisting

IN THE next few years we may see less and less of mine cars on the surface at shafts and slopes, so general is the growth of underground dumping. The difficulty with skip hoisting is that the bottom landing should be lengthwise of the shaft and alongside of it, instead of at a right angle to its longer diameter and athwart the shaft, if the best possible results are to be achieved. This retards the introduction of the skip hoist in any but new plants. The equipment can be changed without excessive difficulty, but the layout of the shaft bottom cannot be easily and quickly turned half way round.

It is likely, therefore, that many operators will, like the Ayrshire Coal Co., adopt the gateless-car hoist, which discharges the car by overturning and possesses all the advantages of the skip except the saving in weight, and also has the advantage of being adapted to the lowering and raising of men and materials as well as to the hoisting of coal and rock.

Gateless-car skips come in at the moment when machine loading and face-conveyor loading seem likely to establish themselves. When coal is loaded by power the lift necessary to clear the car top will be a matter of small importance, and it will be easy to fill cars without raising the end gate. A further advantage will be found in the fact that in thick seams it will be possible to use large cars without an increase in gage, provided, of course, the degradation resulting from the drop into a deep car is not objectionable.

The difficulty resulting from the dust raised by underground dumping, even if this operation be performed in the intake air current, will be more than compensated by the cleanliness of the roadways, and it must be conceded that if the shaft bottom and the roadways adjacent thereto are the mouth of the cannon the workings are the breech where most of the explosions start. If the workings, and especially the roadways leading therefrom, are by use of the gateless car made less subject to explosions, conditions are improved, even

though there may be some dust in the neighborhood of the shaft. However, it would seem that the dust raised in underground dumping might well be drawn by an exhaust fan into a chamber where it could be dampened down, to be drawn off and hoisted at intervals.

Auxiliary Fans

UNTIL recent years auxiliary fans or boosters have been regarded with disapproval. Too often have they been used to churn air already loaded with powder smoke and expired and respired gases. So liable are they to neglect that they are particularly dangerous where gas is present. Moreover, if power fails at the surface they also fail, whereas above ground there is, or at least there should be, another method by which the fan can be driven.

It is true that in case of power failure, local or general, if there is a man in charge of the fan, he doubtless can take care of the situation in accord with instructions given long beforehand. The closing of a door may cause the main air current to make its way into the workings which the booster fan formerly supplied. But this puts a heavy burden on the main fan which it is not designed to meet. The fan installed should be of a size suited to the work it has to perform under normal conditions, and consequently it should be too small to take over successfully all the booster circuits that power failure may put upon it.

One big objection to auxiliaries is the fact that an explosion is likely to put most of them out of commission, even though the main fan may not be destroyed. In such a case that fan must be relied on to ventilate the mine during recovery, which again presupposes a bigger fan than the use of auxiliaries would make necessary.

These are the real reasons why the use of boosters is not advisable. It is probable that with reasonable care in layout and with anemometric readings as a check it would be possible to feel assurance that the air was not doing double duty and not baffling instead of aiding the main current. Assurance of this kind can especially be felt where the main current goes into the mine and returns to almost the same point. Much uncertainty may exist where the air enters by one shaft and leaves by another at a considerable distance with the booster taking and returning air at the two points near at hand in the same main current.

Pooling and Preparation

NOW that coal is being pooled, a careful inquiry is being made into the quality. This will ultimately end in all coal being analyzed or being perpetually subject to analysis—which is much the same thing. Those whose coal comes near the border line of the pool analysis, or which may so come, should the coal vary in quality or carry an inconvenient parting or draw slate, will have to go more deeply into preparation than heretofore has been their practice.

As the availablity of slack increases it is quite probable that before long coals will be crushed prior to preparation, so that, as far as may be, all slate and sulphur will be eliminated. It may not be long before there will be neither in anthracite nor bituminous coal any domestic sizes, and even railroads will be using crushed fuel, as a few are already doing.

A new era will then dawn. No longer will "all is coal that tips the scales" be even in a degree true. Attempts to work into higher-price pools will be made, although perhaps in some instances such an attempt would be accompanied by more loss than profit, for some coals cannot be washed to a low-ash or low-sulphur content. But preparation in any event will be more general, and when pulverized coal becomes widely used we may anticipate a time when high-ash coals will be excluded from cities by local ordinance because of the large amount of ash dust they scatter broadcast.

Almost everywhere the quantity of water available for washing coal is limited and consequently with increased use of water for preparation care will have to be taken to clear the water for re-use. A hard freeze will close off the water supply just when the market is briskest, and fortunate indeed then will be the plant that needs merely an occasionally sweetening admixture to the water that is being used and re-used for preparation purposes.

First Choice of Coal

AT MANY coal plants the first choice of a car of coal goes to the man that runs the steam locomotive and the second to the man who stokes the boilers. If there is a car of clean, glistening coal it is switched to one side for the use of these worthies, and the consumer gets the rest. Fortunately the rest contains a good deal of the cream of the coal, but part of that cream has been taken for the locomotive boiler, if there is one, and part for the stationary boilers, which should be burning bone coal or slack.

The cure for this untoward situation is readily found in equipment that will deliver slack or crushed bone in bunkers above the boilers, and boilers that will burn it satisfactorily. This will give the consumer the choice coal of which he stands greatly in need, for when it arrives at his bins freight rates and selling costs have been added to its price. In many cases the consumer has a smaller plant than the producer and he cannot use with advantage coal that the operator could well use.

In fact the mine operator is a big coal consumer. He himself uses twenty-two million tons out of about six hundred million—about one ton in thirty, or 4 per cent of the coal he produces. He is in a position to undertake to burn coal as economically as any manufacturer using an equal amount of fuel. Nevertheless he is slow to change his methods and contents himself with scolding when he finds his best coal burned below his own boilers and his less desirable going to the market.

Had the coal operator's methods been more modern he would not in so many instances have succumbed to the allurements of the electric power companies. It has been the fact that he used good coal in his boilers, used it wastefully, handled it with an excessive use of labor and then in many cases utilized it to small advantage in the engine room that made him see the argument of the man who urged him to use purchased power. Some of the larger companies did, at length, get competent power engineers, but with the machinery at hand little could be done. There then remained two courses, either to get better equipment or buy power, and the latter proposition in some cases won. It might not do so now with demand rates making the charge on a closed mine excessive, and it cannot win, of course, in the extremely large areas where power is not for purchase. At some places only local power plants generating voltage too low for extended distribution are found. These, moreover, are run with the same or more expensive methods than the plants at the coal mine.

Mining Equipment

Mining Machine Cuts Coal in Stratum That Offers Least Resistance to Cutter Bar

Will Cut Horizontally or Vertically—Makes Middle and Shearing Cut in Thirteen Minutes—Shearing Cut Affords Larger Coal and Coal That Mechanical Shovel More Readily Handles—Cuts from Track or Can Be Set on Tractor Wheels

By M. P. Martin
Huntington, W. Va.

In the accompanying illustrations is shown a mining machine comparatively new to most people interested in coal production. The design is the result of twenty years of exhaustive study of mining conditions and has been evolved with the idea that nature has provided a certain place in every coal bed where cutting can be done to the greatest advantage. That place is where the material to be cut is comparatively soft. The exact position of this stratum may vary widely.

It may not always be practical, however, to mine in the softest portion of the bed; hence a strict adherence to this rule is not in all cases advisable, but in a measure where the height will permit, the best results will be obtained by cutting where the coal offers least resistance, as this not only saves power but time also, as well as much wear and tear on the machinery.

In the mine of the Buffalo Eagle Colliery Co., Braeholm, W. Va., a 78-in. bed is found with a soft stratum so located as to be well suited for cutting. This soft streak of coal is surmounted by a parting of a hard and bony nature which is quite difficult to cut, but which separates readily from the coal when undermined. It is better to mine the soft portion of the bed than to attempt cutting out the parting with the machine, for the undesirable coal can be readily separated. In some coals, where the parting is soft, it frequently has been found advisable to cut directly in the dirt band, and thus dispose of the impurities at the outset. This particular parting, however, is

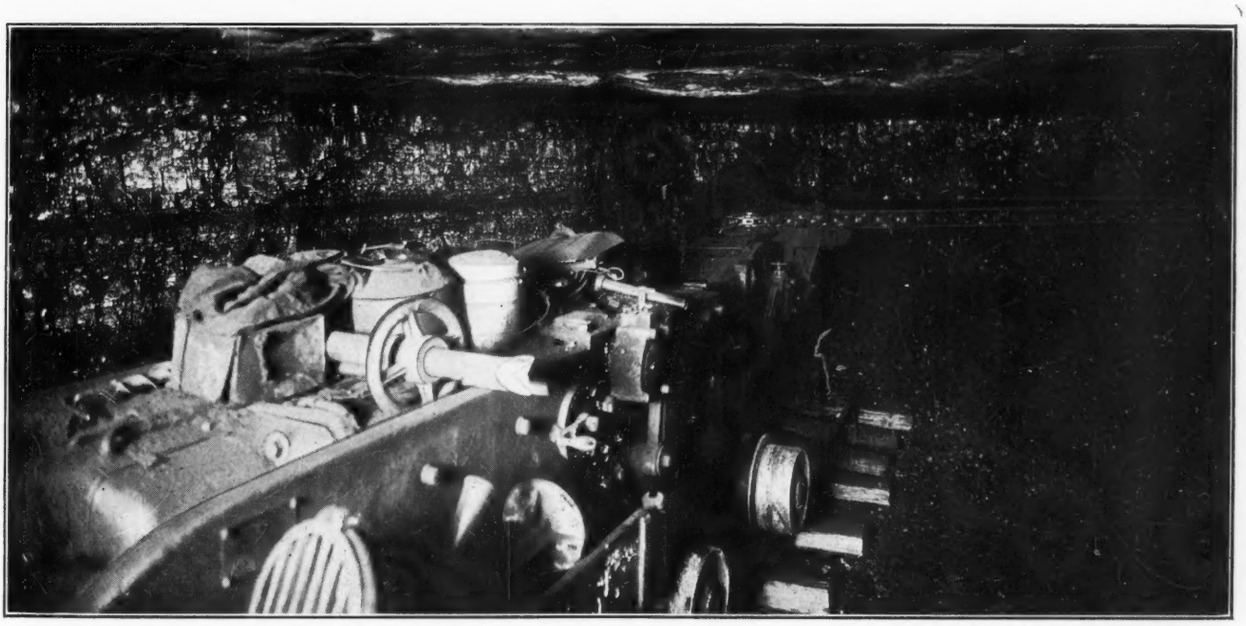


FIG. 1. MAKING A CUT UNDER A SLATE BAND IN MINE OF BUFFALO EAGLE COLLIERY CO., BRAEHOLM, W. VA.
A 78-in. bed has a band of slate immediately over a soft stratum peculiarly suitable for cutting; hence that place is chosen for the cut. The slate band separates quite readily from the coal and is stowed at one side by the loader when filling his cars

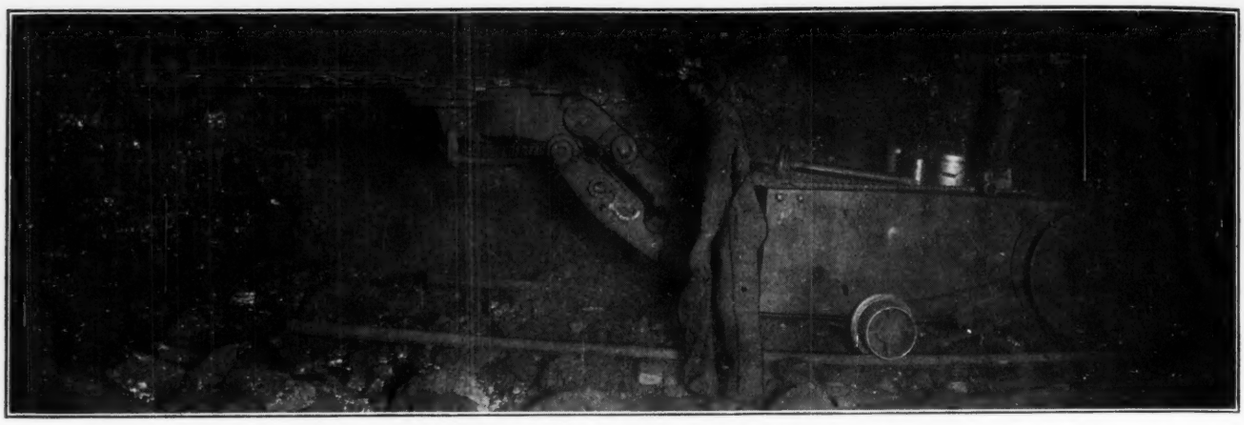


FIG. 2. A TOP CUT IS MADE JUST BELOW THE STREAK OF OILY BONE WHICH COVERS THE COAL
In less than two minutes a machine that has been cutting at or near the floor can be prepared to cut near the roof of the working place. Note that the machine cuts without alighting from its carriage. In this case the slate parting near the middle of the bed is missing.

hard in texture and varies from 3 to 6 in. in thickness. It is found in some parts of the mine and disappears in others. The process of mining just below this band is shown in Fig. 1.

Where this parting is lacking a "streak of bone" about 3 in. thick appears at the top immediately below the roof. It has recently been discovered that this bone contains a large amount of oil as well as much gas. Consequently it is desirable to separate it from the coal. To accomplish this a top cut is made, as shown in Fig. 2.

Changed to Top Cutter in Two Minutes

Since this machine was installed little bottom cutting has been done. Fig. 3, however, shows a bottom cut being made in a 22-ft. room, which well illustrates the adaptability of the machine. The change from a top cutter, operating 6½ ft. above the floor, to a bottom cutter can be made in less than two minutes, while the preparatory step to mine strata intermediate between top and bottom can be taken in much less time.

In Fig. 5 the cutter bar is shown in a vertically edgewise position, just finishing a center shear cut. To start such a cut as is shown in this picture the cutter bar is placed against the roof and sumped in to its full length of 9 ft. It is then fed down until the point of the cutter bar touches the bottom, when the machine is again put into sumping feed, this time in a reverse direction, and sumped out. The reverse of this operation, of course, can be accomplished with equal ease; this is necessary when the shear is made to the left of the center of the machine. A middle cut and a shearing cut were made in this coal bed in thirteen minutes.

Sheared Coal the More Readily Loaded

Where lump coal for domestic purposes is desired a shearing cut increases by from 20 to 25 per cent the amount of this grade obtained. The small amount of power, time and labor consumed in making this additional cut is favorably balanced by the additional amount of lump obtained and the decreased cost of shooting. The advantage of the shear cut is not necessarily confined to the results yielded in the shape of an increased amount of lump. Such cutting is of particular advantage in obtaining the best results from a mechanical loader.

The shear affords a loose end to shoot against, so that blasting down after a cut of this nature will result in the coal being thrown to the center of the room or entry, thus placing most of the material where the loader can reach it most efficiently. The shear cut can be made along any perpendicular at or within 2½ ft. from the outside of either rail. Such a vertical incision usually is made in conjunction with a top, bottom or middle cut.

Fig. 4 shows the machine in position to make a slabbing cut on the bottom. As in the room, the exact place where such a cut is to be made can be determined at the will of the operator. The machine works equally well slabbing upon either side and while moving either

FIG. 3

Making an Undercut

In this instance the kerf is made near the floor of the room, which is 22 ft. wide. A big advantage of this machine is that it is readily brought into action.

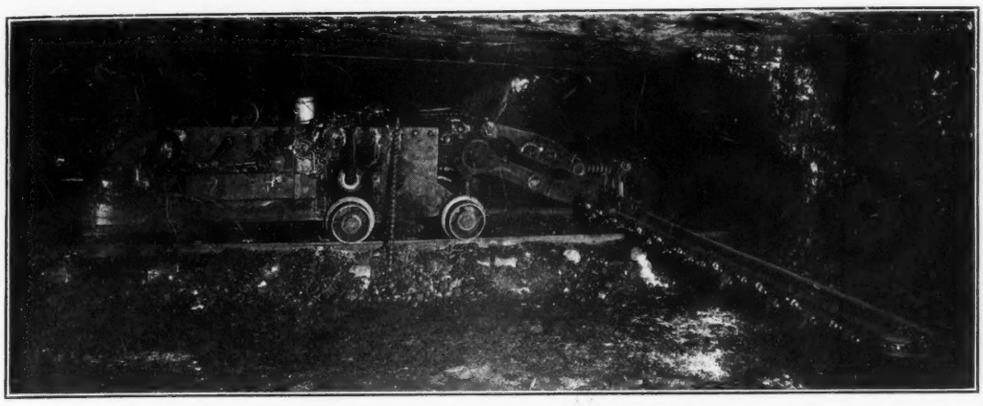


FIG. 4

Starting a Slabbing Cut

The machine adapts itself readily to the slabbing of the side of a room, which some believe is the way in which to obtain large and easy tonnage.

forward or backward. For longwall extraction this feature is highly desirable.

The operation of the machine is exceedingly simple. It cuts from the track at all times, unless provided with tractor wheels, which will permit it to operate upon the floor. The use of ropes and chains as propelling media has been entirely eliminated by direct mechanical drive. The runner may stand at the rear end of the machine and control all its movements, with the exception of feeding the cutter bar across the face of the coal.

Speed Ranges from 6 to 48 In. Per Minute

This operation is accomplished by manipulating the small lever, seen on the neck of the machine in Fig. 3. An important consideration in this connection is that this speed is variable, its range being from 6 to 48 in. per minute. The sumping feed is identical and is controlled in a like manner, although from the rear of the machine. It will be noticed that one of the men seen in Fig. 3 has his hand on this control. The tramming speed is from one to six miles per hour, the motor being geared direct to the truck, thus obtaining positive traction.

This machine, which is manufactured by the Oldroyd Mining Machine Co., of Cincinnati, Ohio, has a record of cutting twenty-three places in an 8-hour shift. It operates upon either direct or alternating current.

FIG. 5. MACHINE WILL ALSO SHEAR THE COAL

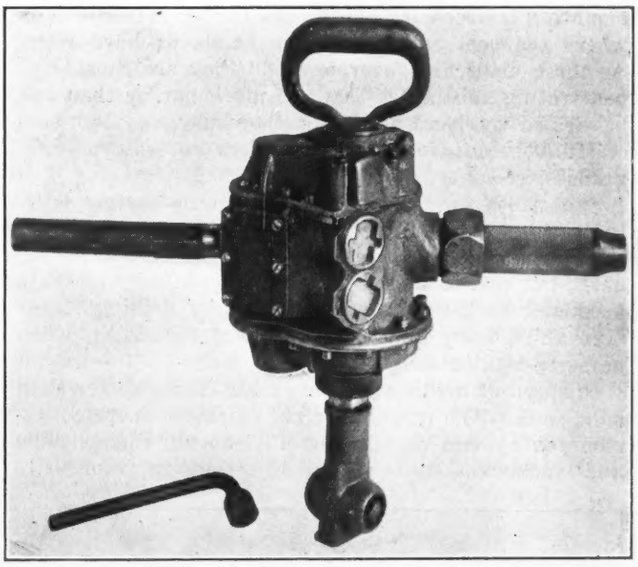
The cutter will work as readily edgewise as flat and so can be made to reduce markedly the use of powder and add to the percentage of large coal obtained.

Labor and Time Saved by Driving Shot Holes by Power Drills

Portable Rotary Power-Driven Drills Drive Holes from Fifteen to Twenty Times as Fast as They Can Be Bored by Hand

By R. S. Marshall
New York City

DEVELOPMENT of the portable rotary power drill for driving shot holes either into the working coal face or into the softer kinds of mine rock has greatly simplified and facilitated the process of coal production. For many years there has been a demand for a strictly portable device of this nature. Light in weight,

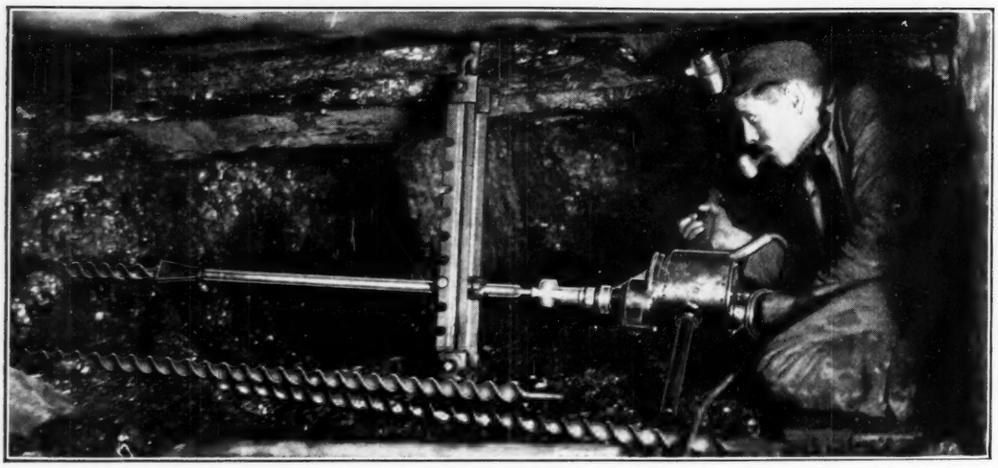


AIR DRILL WITH GRIP HANDLE FLAT-TAPER CHUCK

Bits are made of flat steel twisted into a helix. The rear end is then tapered along the edges so that it readily may enter the socket or chuck on the drill, where it is held firmly by a sunk-head set screw.

they are flexible in operation, sufficiently powerful to sink shot holes rapidly to any practical depth, and have a drilling capacity or footage far exceeding what they are normally called upon to deliver.

The past year or so has seen a rapid increase in the adoption and application of these machines in the coal fields, both anthracite and bituminous. Their advantages in the shape of more rapid shot-hole driving, increased production and consequent lower cost are readily apparent. They also better working conditions, and make the obtaining of men more easy, as



Drilling Low Coal

Low coal, unless unusually soft, is hard to drill with a hand auger. With a portable power drill the work can be done without strain or loss of time.

the miner is relieved of what is often the most arduous of his tasks—hand drilling.

Little Giant drills of this type, as manufactured by the Chicago Pneumatic Tool Co., have successfully met the conditions of service imposed. These machines are built in several sizes, driven by either electricity or compressed air, reversible and non-reversible.

By exhaustive field tests the bit speeds of these machines have been carefully determined. These speeds are such as to yield maximum average results under the conditions imposed. The machines may be used either mounted or unmounted and be operated by either one or two men, as circumstances may demand. A mounting is necessary only in the harder formations or where the coal carries sulphur bands or hard slate. As these drills are "overpowered" they are capable of penetrating substances that are much harder than can be drilled by hand. In fact they may be used successfully in any formation that does not ruin a high-grade steel auger.

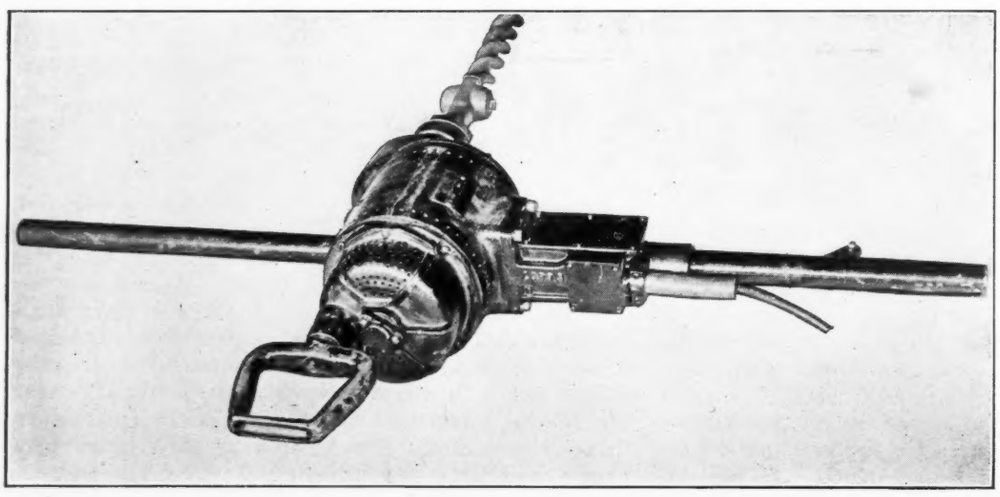
Shot holes on the average are approximately 6 ft. in depth and about 2 in. in diameter. Local conditions sometimes make it necessary to drill larger and deeper holes, but this in no wise affects the efficiency of these machines, as they are capable of easily drilling 10- or even 12-ft. holes in the average coal formation, when properly manipulated.

In speed of drilling they are many times faster than hand work. The medium-weight machines operated unmounted by two men in the Pittsburgh, Connellsville and similar coal beds put in 6-ft. holes in from 50 to 70 sec., which is on the average from fifteen to twenty times as fast as can be attained by hand methods. The average energy demand of these tools is from one to two horsepower. This permits the actual drilling of several hundred feet of holes per day at a cost amounting to only a few cents for power. The saving in time, labor and money is thus obvious.

In hand drilling it is not uncommon for the holes (top ones especially) to "run short." This tends to permit the coal to overhang and gives an unsatisfactory condition of the roof. With these drills extremely thin beds can be economically extracted, which cannot be accomplished with any degree of profit if the drilling has to be done by hand.

The standard form of mounting used is of either the frame or post type. The feed bars and boxings are furnished with various pitches of threads, so that the drilling speed of mounted machines can be regulated to suit conditions. The augers are of different "rolls" or sections, each applicable to drilling certain formations. Three standard forms of bits are normally used, namely, fishtail, half diamond and full diamond.

Certain modifications of these three forms are made to meet special conditions such as those imposed by "mine rock"—hard slate and shale, etc.—but those mentioned can be considered adequate for all practical purposes. The fishtail bit is a rapid cutter and is used in the softer coals. The half diamond is employed in medium hard and the full diamond in the hardest of coals, slate, etc. The standard form of tang and socket is a flat taper.



Electric Drill

Note grip handle behind the motor and the long bar handle by which the machine is prevented from turning. The long auger, of course, has been cut off short to reduce the illustration to reasonable size.

HUNT ELECTRIC SHOVEL LOADING PILE OF COAL INTO A MINE CAR

Rotary Shovel That Clears Wide Path but Delivers to Fixed Point of Discharge

Standing 36 In. Above the Rail with a Low Center of Gravity, the Hunt Machine Requires Neither Rail Clamp Nor Outriggers to Prevent Upsetting—Tests on Ore Loading Have Shown a Reduction in Costs Over Hand Loading Amounting to 74.2 Per Cent

By S. H. Hunt
Milwaukee, Wis.

DURING the past year a new mechanical shovel or loading machine has been developed by the Milwaukee Coke & Gas Co. which utilizes a rotary motion in delivering its material to the mine car. The machine, which is extremely compact, was designed by S. H. Hunt, chief engineer of the company.

Digging is accomplished by four revolving buckets which thrust themselves forward into the pile of material to be loaded in such a manner as to be readily filled, dump their load upon a belt and then recede into the cylinder to which they are attached. The action of these buckets is positive; they are actuated by a cam of high wear-resisting quality. The process of loading is practically continuous instead of intermittent, which makes this a machine of exceptionally large capacity considering its over-all height, which is only 36 in. above the rail.

A conspicuous detail in the design of this machine is the complete housing and protection of its mechanism against dirt and water as well as the extremely rough usage to which such equipment is subjected in a mine. The working range is 10 ft. in width, all movements being controlled by three hand levers and one foot lever. The end of the belt which delivers material to the car has a fixed central point of discharge regardless of the angle with the track at which the scoop shovel may be working. Because of the low center of gravity of the machine, its stability in any working position is such that rail clamps and outriggers are unnecessary.

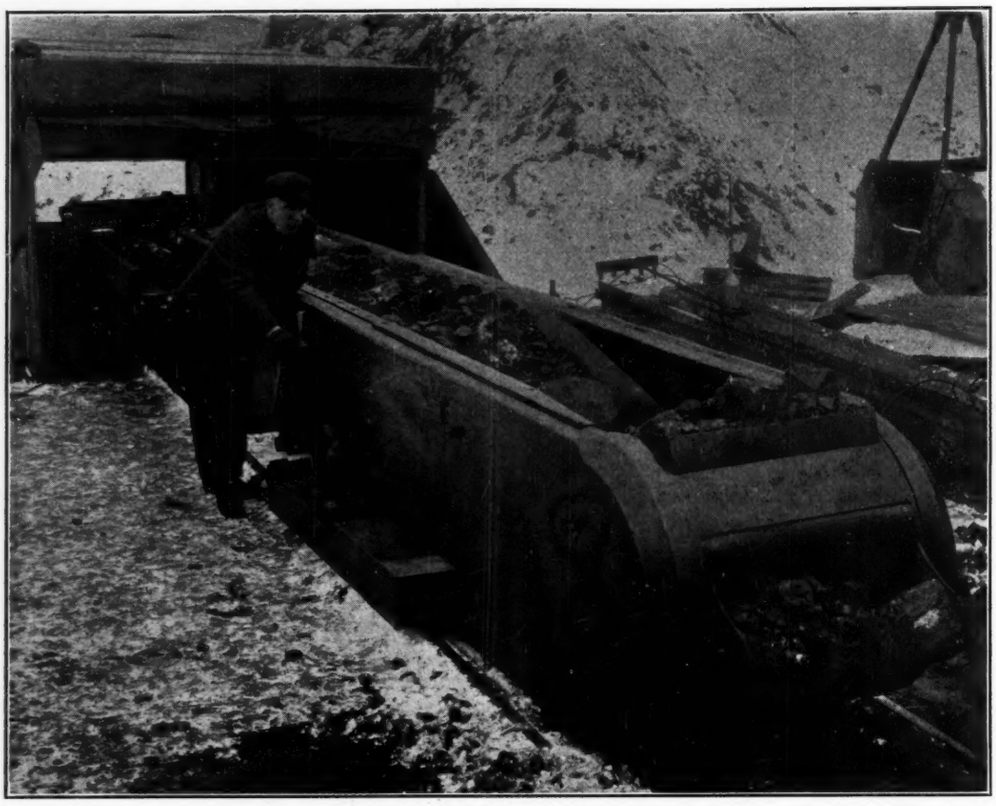
This loader is driven by a single 15-hp. motor, which is twice as large as is required for the accomplishment of any one of its functions. This motor is located between the forward and rear gear-reduction cases. All gears are of heat-treated chrome-vanadium steel having Fellows stub teeth, which operate in oil. All bearings are of the Timken type, and the speed reduction is obtained by means of a Timken-David Brown worm gear. No cast iron enters into the construction of the machine, as it is considered that only steel castings will afford the desired margin of endurance.

The machine has two speeds forward and reverse. It slews readily to either side, it digs and delivers the material mined, and the entire machine can be elevated or lowered so as to adjust the digging to any unevenness of the mine floor. The foot lever which controls this latter movement also disengages the traction clutch, allowing the loader to be moved about the mine by power other than its own.

Automatic Guards Against Careless Operation

Certain automatic features have been embodied in the design that afford protection against careless operation. The slewing movement is stopped at its proper limit, making it impossible for an operator to overrun and upset his machine. Should the buckets come in contact with any obstacle that they are unable to move, the multiple-disc driving clutch slips, making it impossible to injure the buckets or the machine. In advancing into a pile, sufficient traction is allowed to fill the buckets properly, but even with the forward speed unchecked the driving wheels slip on the track before excessive stresses are imposed upon the propelling mechanism.

Safety, which is highly essential in mining machinery, was primarily considered in the design of this loader. In addition to protecting all moving parts, the truck wheels are entirely covered by steel castings, precluding



Front View

The shovel in this view faces straight ahead on the mine track. It is easy to slew it to the right or left, and when that is done the position of the discharge end is not changed. Note the wide belt by which the coal is carried from the point where it is discharged by the buckets back toward the mine car. The working range for the buckets is 10 ft. The loader is driven by a single 15-hp. motor.

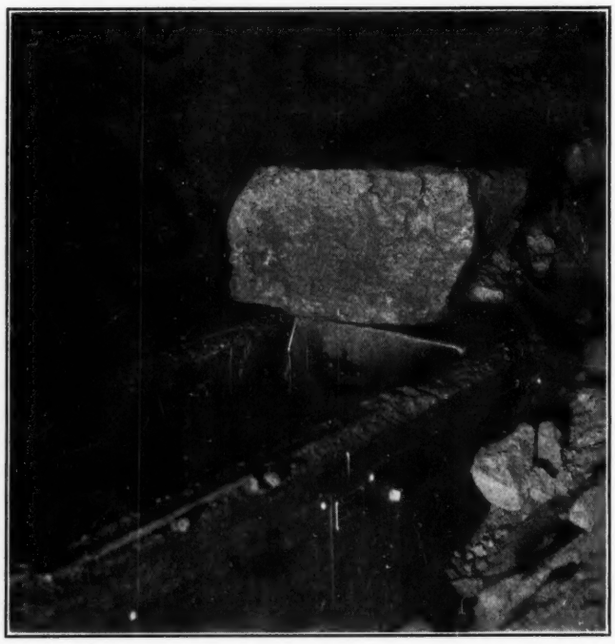
the possibility of the operator getting his foot on the track while the machine is in motion. These same castings remove loose coal or ore from the rails and serve as an additional support for the swinging body. The belt conveyor extending over the mine car can be telescoped within the machine proper by means of a rack. This facilitates the movement of the loader around sharp turns or in rstricted places.

This machine was given its first test in loading coal cars at the face at the Weeksbury mine of the Steel & Tube Co. of America. The roof of the working place in which it operated was 39 to 42 in. above the track. Under these conditions the average loading time per car of 1¼-tons capacity was forty-five seconds. The ability of the machine to load coal from a standing face the coal from which has been shattered by a shot but could ordinarily be removed only by hard picking, showed it to be extremely sturdy and particularly well adapted to its work.

No mechanical or electrical trouble was experienced in the five days of its operation. The arrangement of track employed in this mine, however, prevented continued production to advantage, and it was evident that a different haulage method would have to be devised in order to move the cars promptly after they were loaded. Accordingly the machine was sent to Mayville, Wis., for a tryout in hard iron ore.

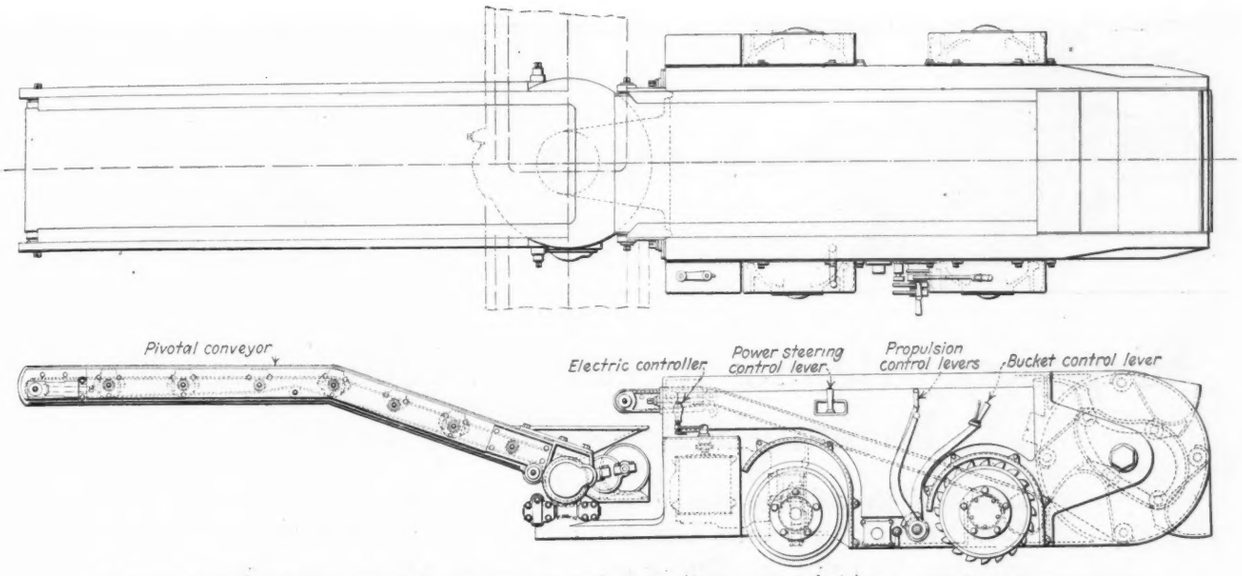
Alternate operation in low coal and in hard ore provides what may be properly termed the two extremes of mechanical loading. Iron ore as found in the Mayville mine is a material exceedingly hard to win, breaking, as it does, in big chunks. The bed rests upon a clay bottom with water flowing over it. Tracks carrying heavy loads are maintained with difficulty in new working places. At this mine both running and passing tracks were used. Upon the former a trip of empty cars was delivered to the loader. When the end car was filled it was switched to the passing track. As soon as a trip of loaded cars was made up on the passing track it was pulled to the shaft by a locomotive and at the same time another locomotive began spotting empties behind the loader in such a manner as to repeat the loading operation.

During the three consecutive days that time and tonnage were observed in loading by mechanical means



LOADING CHUNK OF IRON ORE WEIGHING A TON

This lump of iron ore weighed 2,100 lb. and measured 38½ x 24½ x 20 in., a mass of ore that seven men could not lift. The width of the bucket that has lifted this big block of ore is 28 in. In the shift that preceded this feat 316 tons of ore were loaded out.

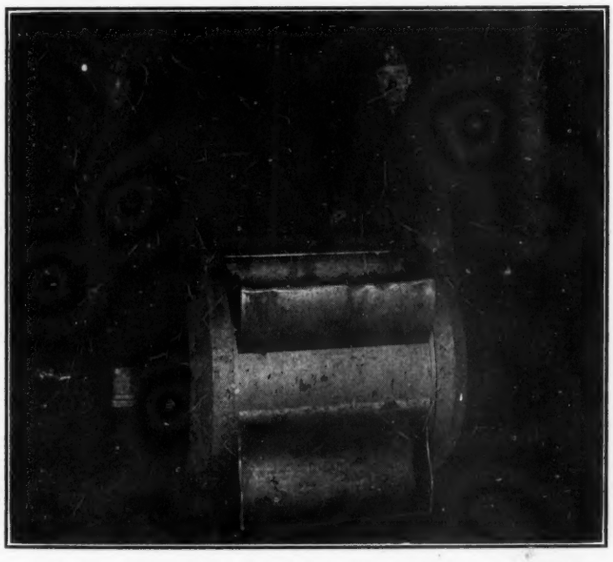


PLAN AND ELEVATION OF SHOVEL AND CONVEYOR SHOWING THE VARIOUS POINTS OF CONTROL
Note the peculiar cam surrounding the shaft which gives a suitable crowding motion of the buckets, a good clear lift and a discharge that does not injure the coal. The front wheel is furnished with teeth that assist in crowding the buckets into the pile.

the rotary shovel averaged 260 long tons per shift of eight hours, showing a reduction in comparison with hand labor costs of 74.2 per cent. Throughout the test some interesting time records were noted for loading cars having a nominal capacity of 2.7 long tons. Quite frequently a car would be loaded in from fifty to fifty-five seconds, the best time noted being thirty-one seconds. A trip of six cars was loaded in ten minutes 25 seconds, which time included switching and spotting. Throughout the entire test the time of placing and loading each car was taken with a stop watch.

A new design of this type of shovel has recently been completed which introduces a number of details making it particularly adaptable to the mining of coal of limited head room by either the room-and-pillar or longwall method. The capacity of the first design has been maintained in the second, but the length and weight have been reduced approximately one-half. The new shovel is not dependent upon track for loading operation and only when moving from one room to another will it travel upon the rails that are used by the coal cars. By operating off the track the working range is greater than would otherwise be possible. By using a pivotal belt, cars can be filled from almost any angle.

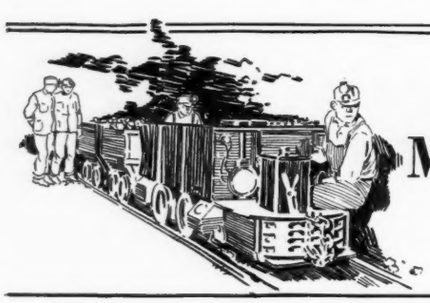
The new machine has a three-point suspension, causing the two driving wheels to be in contact with the floor at all times, no matter how irregular the floor may be. Steering is accomplished by power. This relieves the operator of an arduous task. The wheelbase is sufficiently short to permit the machine when moving from one part of the mine to another to follow the track curvature without steering. The pivotal belt can be raised or lowered and swung through an arc of 180 degrees. The length of the machine proper is 8 ft. 10 in., the over-all width is 4 ft. 2½ in., and the height, measured from the rail, is 36 in.



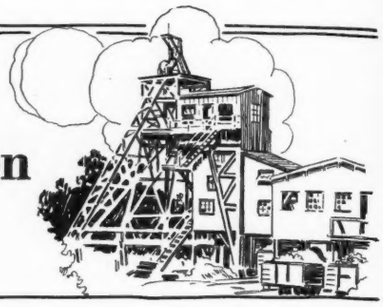
FRONT VIEW OF MACHINE WITH EMPTY BUCKETS
By comparing the height of the machine with the men who are preparing to operate it it is easy to see how low it is built. It is only 36 in. high, having been designed for operation in a bed of coal running between 39 and 42 in. in thickness.

Portable Compressed-Air Machines Have Many Uses at Coal Mines

REPLACEMENT of compressed-air piping by electrical wires has made it difficult in many mines to employ compressed air for uses to which it is much better suited than electricity. In consequence the introduction of portable air compressors has been rapid. Electricity cannot be used in the mining of highly gaseous coal and in such cases portable compressors make possible the operation of ordinary and post punchers. Compressed air is preferable for drilling in hard rock and well adapted for drilling in softer material. Cement-gun work demands the use of air under pressure, and by use of it electrical workers can rapidly drill holes in the hardest of mine roof for the reception of trolley-wire hangers. Such portable compressors are useful for the operation of riveters and paint sprays and might be profitably employed for the dislodgment of coal dust from the tops of timbers and the ribs of haulageways. With a portable compressor near the point of application there is little fall in pressure and much economy in operation, but care should be taken that the compressor is not overloaded.



Mine Transportation



Experience Results in Radical Changes in Mine Locomotives for Heavy Duty

Leaf Springs and Equalizing-Bar Suspensions Make Derailments Less Frequent—Frames Cut from Steel Plate Resist the Inevitable Violence in Operation—Tandem Operation Makes Bigger Trips Possible—Electric Brakes Prevent Runaways

By B. S. Beach*
Schenectady, N. Y.

MANUFACTURERS of trolley-type locomotives and their equipment, profiting by long experience, have been developing during the recent past new methods of construction and new control devices that largely enhance their ability to fill the needs of the mine. The result has been that locomotives today are better suited to mine service than ever before. Experience has dictated that the strength of the locomotive frames may be increased over that of the old cast frame by cutting them from solid plates of rolled steel, and this practice is now being followed by the General Electric Co.

The reason for this preference is that rolled steel is of uniform strength throughout. It is free from blowholes or other structural weaknesses. The end frames of the locomotive are built up of steel channels fitted with wooden bumpers, which in turn are faced with steel protection plates. Metal for the purpose of balancing the locomotive, and, in some sizes, to afford also the necessary weight for traction, is bolted across the frame in the rear of the end channels.

Experience has shown that the springs of a mine locomotive play no small part in its ability to haul coal. This is because the track in most mines is more or less temporary in nature. As a result derailments are frequent, and the rough riding subjects the equipment to hard usage.

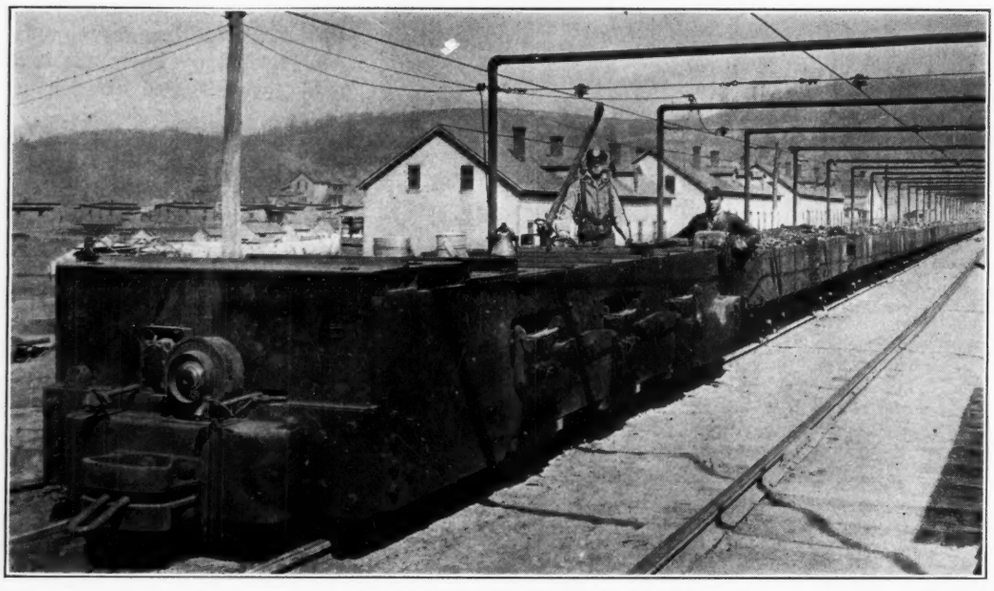
Equalizers Assist Wheels to Stay on Track

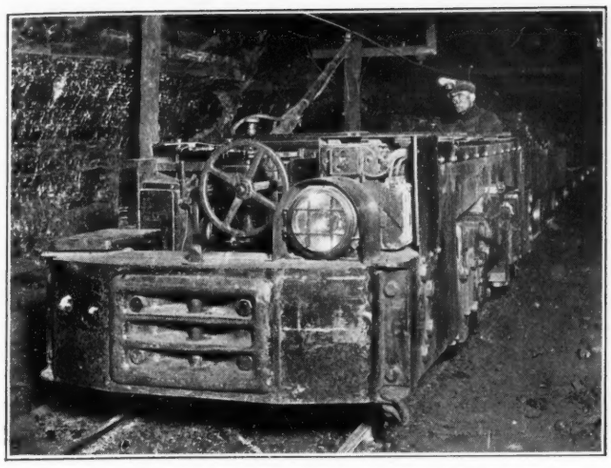
Semi-elliptical springs with equalizer bars on each side of the locomotive are now supplied to the two-motor units. This construction has been adopted because the three-motor types that have been thus equipped for several years have given highly satisfactory results. With the usual irregular mine track the weight of the locomotive does not rest equally on the

*General Electric Co.

Three-Motor Locomotive

This unit weighs twenty-five tons and has contactor control and equalized leaf-spring suspension. It is used at one of the mines of the H. C. Frick Coke Co. Note the long trip of steel cars which this locomotive is hauling.





LOCOMOTIVE WITH CONTACTOR CONTROL

Thirteen-ton locomotive with equalized semi-elliptical springs at mine No. 57 of the Springfield District Coal Mining Co., Springfield, Ill.

drivers unless some equalizing action such as this is provided. With it the cost of track maintenance is lowered, the locomotive rides more smoothly and, on a rough track, the likelihood that the wheels will kick loose is reduced. The combination of semi-elliptical springs and equalizers also allows greater vertical movement of axles and journals. Thus the locomotive is less frequently derailed than under the former arrangement.

When a locomotive having the new type of outside frame is derailed, the lower edge of the side frame clears the rails far enough to allow blocking and other re-railing devices to be slipped into position, so that the machine can be readily put back on the track. The old outside frame cleared the track only about three inches and when the locomotive was derailed the wheels could be reached only with difficulty. Consequently, much time was lost in getting the machine back on the track.

End Thrust Taken Up by Renewable Disk

All outside-frame locomotives are equipped with end-thrust journal boxes. A heavy bolted-on end cover carries a renewable bronze wearing disk which takes the thrust from the end of the axle, thus relieving the wheel hubs from wear. At the back a fibre dustguard is provided, which in connection with the tight-fitting front cover effectually excludes sand and dust. A waste-packed oil cellar provides lubrication and the linings can be easily removed and replaced simply by unbolting the end cover.

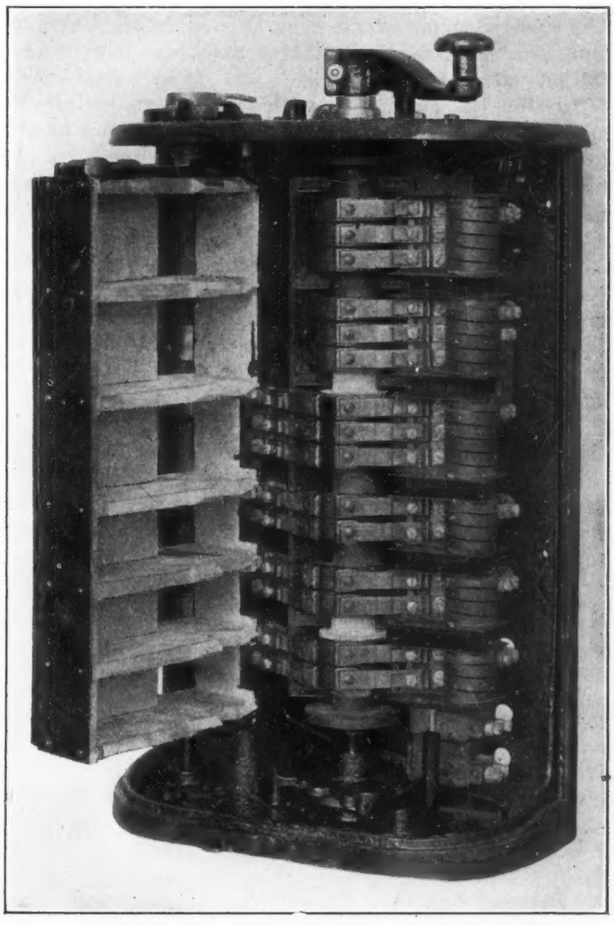
Motors employed on present-day locomotives are designed to endure the hard usage to which they are subjected. They are all of the inclosed split-frame type, series wound, with the armature carried in separate bearing heads. The motors are fastened in place by suspension bars, which are in turn spring-supported from the frame. As the suspension lugs are on the lower half of the motor frame, the upper half can easily be removed, and the armature taken out for inspection or repair without disturbing other parts. Ball bearings on the armature journals serve several purposes; they prevent the armature from touching the pole pieces, maintain commutator alignment and eliminate the leakage of oil into the armature, which frequently occurs when waste-packed bearings are employed.

The wide variety of track gages now in use has made standardization of motor equipment a difficult problem. Sizes up to and including twenty tons are normally fitted with two motors. For larger sizes and where more capacity is desired than can be obtained on two axles, because of the gage or other limitations, three-axle locomotives have been developed. Where light rails limit the amount of weight per driver, and it is not possible to obtain sufficient capacity on two or three axles, tandem locomotives are employed.

Tandem locomotives may be equipped with a four-motor controller on one of the units (called the primary half), while the other (or secondary half) is equipped with no controller, constituting a permanent tandem. Each may, on the other hand, have a two-motor controller, which permits each section to be used separately. Sometimes both units are equipped with four-motor controllers, making either of the halves primary and permitting a greater range of application and flexibility where several locomotives are used.

Control systems also vary with the weight, voltage and number of motors, being designed to meet the requirements of the special variety of work demanded of that particular locomotive. Four-, 6- and 8-ton machines, which include the trolley gathering types, are called upon to make frequent starts and stops at switches, room necks, etc. A new type of electric-braking controller was developed to meet this service.

It is a drum controller of the series-parallel type,

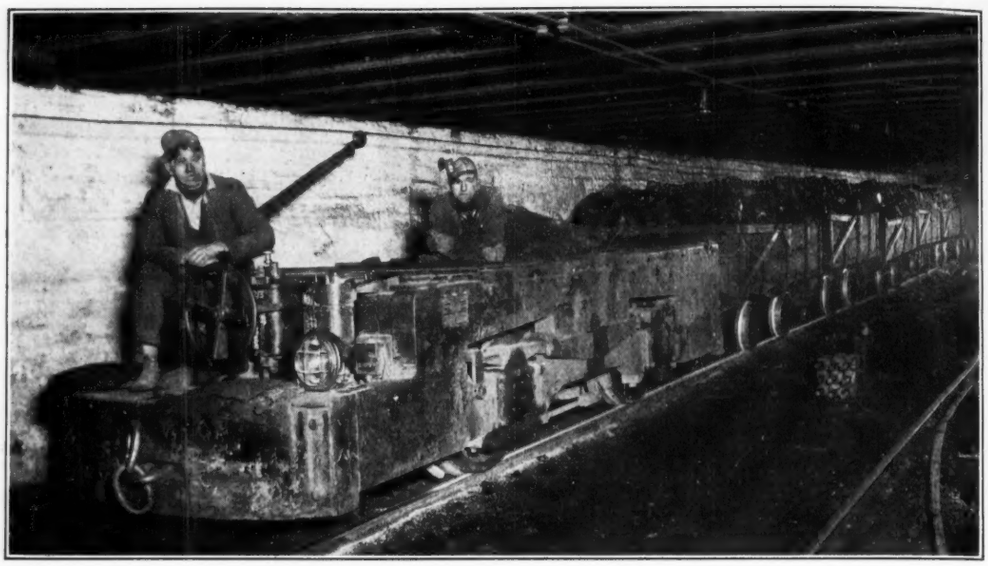


CONTROLLER FOR HEAVY LOCOMOTIVES

The shelf-like asbestos arc chutes in the cover when closed isolate the various fingered contacts. The individual blowout coils on the right extinguish magnetically any arc that may be formed.

Heavy Locomotive

This illustration shows the equalized leaf-spring construction used to promote an even distribution of weight on the drivers despite any unevenness of the road. This view is taken at the West Frankfort mine of the Chicago Wilmington & Franklin Coal Co. The locomotive weighs fifteen tons.



arranged for rheostatic braking, and furnished with restricted arc chutes and individual magnetic blowouts. The series-parallel feature insures series starting, thus minimizing loss of energy either in starting or running slowly in the parallel position. The reverse cylinder is provided with four operating points, two for each direction of motion—namely, braking forward, motoring forward, motoring reverse, and braking reverse. The electric or rheostatic braking is a detail providing much economy, as it eliminates skidding, with its resultant flat spots on the wheels.

To stop the locomotive with this controller, all the motorman has to do is to throw the main cylinder handle to the indicated braking position. The degree of braking is governed by the main cylinder, and the trip can be brought to a stop, as long as its weight and the grade are within the braking capacity of the locomotive. A runaway is impossible with this electric control, even though the trolley jumps the wire while braking is being performed on a grade. In such a contingency the locomotive will start and stop, start and stop again until held at rest either by a level grade or by the hand brakes.

As the work done by the larger machines consists in the main of long hauls with heavy trips, a different type of control is employed. These are of the rheostatic, series-and-parallel variety. The fingers are fitted with removable burning tips, and with individual blowout coils for extinguishing arcs. Asbestos arc chutes are provided, which aid further in extinguishing any arc that may be formed.

Contactor Control Lowers Operating Cost

On 250-volt installations, where greater current capacity must be provided, particularly on 13-ton sizes and larger, many users prefer a contactor type of control. This, while more expensive initially, can be operated with lower maintenance cost. Such installations now in use consist of a master drum controller and reversing switch, mechanically interlocked. These are mounted in the motorman's "cab." The five contactors which open and close the main operating circuits are located at any convenient and accessible point on the locomotive. This also is a series-and-parallel type of control, the main line and resistance connections being made by means of a drum switch, which is provided with six points, with either kind of operation of the motors.

While this system is much more elaborate than any of the others, and its initial cost is higher, its savings through lessened maintenance and more satisfactory operation are sufficient to more than counterbalance the increased outlay.

Price of German Coal Raised 23 Marks Per Ton; Miners to Get Better Food

THE rise of German coal prices, reported several times to be impending, has now taken place. The demand of the mine owners was for an increase of 30 marks per metric ton, which they asserted to be necessary for balancing increased expenses. The rise now granted is 23 marks per ton, of which 5 marks are to be contributed to a fund for bettering the food supply to the workmen. This is intended to make up for the now abolished payments of 5 gold marks per ton granted for all deliveries made under the Spa treaty, which were to be devoted to a similar purpose. The payment of this sum, which in the aggregate amounted to 10,000,000 gold marks per month, has been stopped since February. This rise applies to the production of the Ruhr district. Rises of from 15 to 20 marks have been or will be granted to other sections, with the exception of Upper Silesia, where a rise has taken place already.

The price of brown coal has been raised 80 pfennigs per ton of coal, and 2.50 marks for bricks. This increase also is to be paid into the funds mentioned above.

This new adjustment of coal prices, satisfying only part of the claims of the mine owners, is to be considered only a step on the upward grade. It brings the price of Ruhr coal up to nearly 250 marks per ton at the mines. The freight charges, an increase of which also is impending, bring the cost of coal in the coast districts up to a figure which is not far below the latest quctations for English coal. Under such circumstances the question of decontrol of coal imports is receiving increased attention. An increase of imports is indispensable in the interest of shipping, as the harbors now have insufficient stores of English steam coal. The industry also strongly advocates a more generous attitude toward coal imports, in order to obtain the high-grade English coal used in pre-war times. The main consideration against decontrol is the apprehension that German coal would be marketed as and at the price of foreign coal. For fear of unscrupulous dealings of this kind the regulation restricting the grant of import licenses to dealers who imported coal in pre-war times—excluding firms established since then—will be upheld, in spite of the evident injustice of such privileges.

Designing the Storage-Battery Locomotive to Meet Conflicting Needs

Design of the Accumulator Locomotive Is a Complicated Problem—In the Last Analysis It Becomes Not a Compromise Between Evils but the Attainment of the Greatest Possible in Both Reliability and Battery Capacity

By C. W. Smith*
St. Louis, Mo.

MUCH has been written in the last few years regarding the development of storage-battery locomotives and their availability for the transportation of materials, particularly coal, in the haulage of which this type of machine up to the present time has found its most extensive application. This subject is becoming of increasing importance to the coal-mining industry because of the full recognition finally given to the value of this type of motive power when properly applied.

During the first few years of its development the storage-battery locomotive received a large amount of criticism. This was more or less warranted because of certain defects and crudities in early design. The points subject to censure were, first, mechanical and electrical unreliability and, second, the limited range or "cruising radius" of the machine, arising from its low battery capacity.

In the United States, as far as we can ascertain, the first application of a storage battery to a mine locomotive was made about the year 1912, but in 1915 a number of manufacturers began the construction of this type of machine. They approached the problem from quite different standpoints, and two main types of storage-battery locomotives resulted. These, with their subsequent refinements, persist even today.

Early Locomotives Fall Into Two Classes

The trolley type of locomotive in the year 1915 had reached a satisfactory stage of development. Manufacturers of this variety of equipment approached the storage-battery locomotive problem rather reluctantly. This, in many cases, resulted in the development of a modified trolley type of machine, with the elimination of the trolley pole and the substitution of a battery. Thus the first result was a locomotive heavy, pounderous, awkward in both appearance and performance, and possessing a battery of a seriously limited capacity.

Individuals and manufacturers who approached the design of a battery locomotive as a distinctly new type, one which must be developed along original lines, made their errors also, those mistakes being of the type that are almost inevitable in any new mechanical construction. The result was that in the first few years machines were built that gave an undue amount of trouble and types were designed that subsequently had to be discarded.

It must be confessed, therefore, that up to within the last few years battery locomotives were subjected to more or less well-warranted criticism. Even today in certain localities a feeling persists that a battery locomotive is unreliable and of a strictly limited applicability. This belief was engendered by machines of extremely small accumulator capacity.

Batteries and Charging Equipment Improve

However, the principles which underlie the successful design of the battery locomotive soon became recognized, and several years ago "freak" types began to disappear. With the combined experience gained from trolley-locomotive practice and the elimination of faulty mechanical and electrical design a series of machines was evolved that in appearance and operation meets to a satisfactory degree the severe requirements imposed upon this class of equipment.

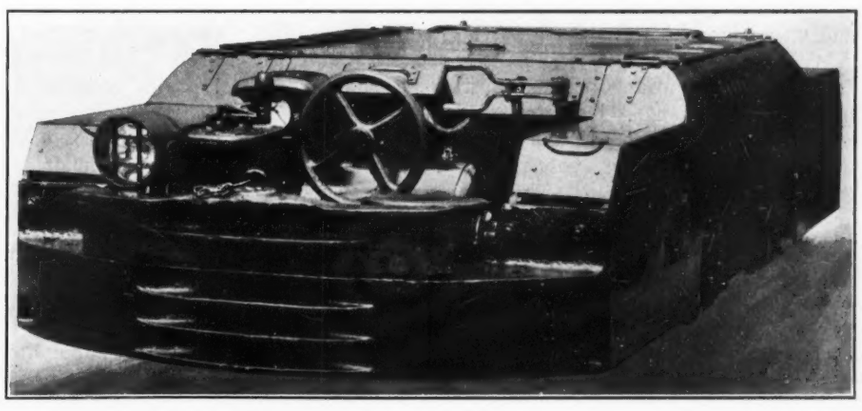
The storage battery itself has developed simultaneously with the locomotive. In particular its capacity greatly increased. Charging equipment has kept equal pace with that development. These two accessory elements, as will be readily apparent upon reflection, are just as important as is the locomotive itself.

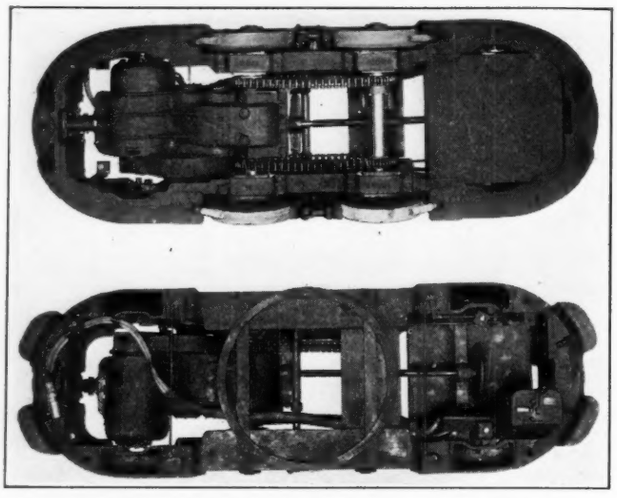
The final result has been that today a well-balanced line of speedy and rugged machines, adapted to almost

*Mancha Storage Battery Locomotive Co.
Illustrations furnished show Mancha Storage-Battery Locomotive Co.'s equipment.

Thirty-Inch Locomotive

A storage-battery machine weighing only four tons in use in the mines of the Akron Coal Co. The illustration, being taken from the front, naturally shows the length of the locomotive greatly foreshortened.





CHASSIS SEEN FROM BELOW AND FROM ABOVE

Note the single motor with chain drive to the front wheels. The controller and brake wheel are located at the opposite end of the locomotive from the motor.

all the highly varied requirements of mine transportation, has been offered to mine operators. A comprehensive inspection of the various modern battery locomotives gives a satisfactory impression of the "rightness" of their design.

Differences in model have today settled down so that now there are only two classes of design: First, as to type of transmission and, second, as to single or multiple motor drive. Each type of drive and transmission has its champions and each possesses certain possible advantages. Limit in the use of any battery locomotive depends entirely upon its effective battery capacity. It is quite reasonable to suppose that if the capacity of the accumulator were boundless this type of machine would entirely supplant all present trolley equipment.

The tendency, therefore, today is strongly toward increased battery capacity in accumulator locomotives. This has a marked bearing upon the design of both the electrical and mechanical elements of these modern machines, and, on account of the reasons outlined above, is a problem peculiar to this type of mine tractor. Accordingly the ratio of battery capacity to total locomotive weight has gradually increased during the last several years until in some cases it has approached 10 kw.-hr. per ton.

Can Give Great Power but Size Interferes

This is a point that well warrants careful consideration in the selection of a battery locomotive. However, a certain practical limit is imposed upon the undue extension of this ratio on account of the increasing width and length of the machine that naturally results.

Weight, width, length and height are often limiting factors for the mine operator in the selection of his haulage equipment. The problem, so far as he is concerned, then becomes one of finding a locomotive within his limitations yet possessing the requisite effective battery capacity. This problem has been well appreciated by battery-locomotive manufacturers, and the more recent designs show a marked tendency to incorporate such features as are calculated the better to accomplish the above results.

The question of single- versus multiple-motor drive becomes one of importance. Exponents of single-motor equipment claim higher electrical and operating efficiency—in other words, a greater effective use of a given battery capacity. Many tests and figures from actual operation seem to substantiate this contention in no small degree.

On the other hand, champions of the multiple-motor type claim that greater simplicity and reliability are inherent in this design. Individual motor drive on each axle presents certain aspects of simplicity, but if this is obtained at the sacrifice to a marked degree of effective battery capacity, the superiority of such design as applied to storage-battery locomotives may be questioned, provided it is possible to obtain equal simplicity and reliability with single-motor equipment.

Practical considerations, except in unusual cases, also demand that the battery in a locomotive shall be self-contained and of sufficient capacity for a single shift's work without the necessity of boosting or battery exchange. This again emphasizes the importance of a maximum effective battery capacity in comparison to total locomotive weight and its limiting dimensions.

The first requisite of any satisfactory machine, of course, is reliability and a reasonable freedom from breakdowns. This particularly applies to haulage units in coal-mine service. Second in importance in the case of the storage-battery locomotive comes the necessity that the accumulator have ample capacity for a full day's work. There is little to choose between a burned-out armature or a played-out battery when it comes to tonnage loss in a day's run.

There is, therefore, a close relationship in the design of a storage-battery locomotive between reliability and battery capacity, for in the effort to reach the maximum of one, the other may be seriously sacrificed. The problem has been to reach not a happy medium but the highest possible capacity in both requirements.

Seeking to Obtain Well-Balanced Design

This search for a design embodying a high degree of mechanical and electrical reliability and the maximum in battery capacity has led to an exhaustive study of both general design and details of construction. General design takes into consideration the kind of drive, motor specifications and characteristics, transmission layouts and types, also the location of parts in the chassis. Details of construction cover such matters as the frame—its type and material—type of bearings, the construction of transmission units, and the general quality of material and workmanship.

General design is of the greatest importance. Space and weight are limiting factors. Each unit used must be as light and compact as is consistent with the strength and ruggedness required in an unusually severe kind of service. It stands to reason that for any given weight of locomotive the lighter the general chassis design, the greater may be the weight of battery used. And not only must the power and transmission units be compact and of the lightest consistent weight but they also must be of a type that will obtain the greatest mechanical and electrical efficiency from the given amount of energy stored in the battery.

This brings into careful consideration motor characteristics, such as speed, voltage and general design. Also here is encountered the issue of single- versus multiple-motor drive, together with the transmission units required for either type.

Selection of the locomotive frame must be approached with the same object in view—namely, rigidity and strength without excessive weight. A mine locomotive

is subjected to much abuse and many accidents, ranging all the way from ordinary derailments and wrecks to dropping down shafts and sliding down inclines and slopes. The frame bears the brunt of such mishaps and should be able to withstand extraordinary accidents without distortion, misalignment, or fracture. Upon its ability to do so depends the safety of the mechanical and electrical units placed within it.

Other considerations enter into the design of the storage-battery locomotive which have a direct bearing upon its general usefulness and ability to deliver the greatest possible tonnage. Such a machine must be easily and comfortably operated with the maximum convenience and safety for the motorman and the expenditure of a minimum of physical effort on his part.

This involves such considerations as brakes, lights, signals and the general arrangement of control. A slow and awkward brake may appreciably affect a day's tonnage. Faulty lights will do the same. A poor and unreliable sanding device causes delay when proceeding either up or down hill, as well as an occasional wreck or derailment. All these details need careful consideration, for in the aggregate they may seriously depreciate the capacity of an excellent machine.

Accessibility of mechanical and electrical units is important both for inspection purposes and for repairs. This is of secondary consequence but has a direct bearing upon the length of time a locomotive may be in the shop as well as upon its cost of upkeep. Many a good machine has been scrapped before its time because of the inability or reluctance of repairmen to take the time necessary for difficult problems of inspection, adjustment or repair.

LOW-TYPE LOCOMOTIVE AT SOLVAY COLLIERIES PLANT

This locomotive weighs six tons and stands only 33 in. above the rail. The trolley locomotive travels in headings that can be made high but the storage-battery has to make its way into low rooms. It is remarkable how it has been found possible to keep the height of accumulator machines so strictly within the bounds that their necessities mark out for them.

It is, therefore, apparent that the design of a storage-battery locomotive entails problems of a highly complicated and intricate nature. Their solution requires not only fine engineering judgment but due appreciation of the actual conditions under which the machine must operate and the nature of the work it inevitably will be called upon to perform.

Alden Coal Co. Installs Large Hoist Which Brakes Itself if Anything Goes Wrong

Large Cylindro-Conical Electrically-Driven Back-Geared Hoist Is Provided With Many Features, Both Automatic and Manually-Operated, That Insure Its Safe and Efficient Operation

By Lewis W. Le Grand
Wilkes-Barre, Pa.

A LARGE 400-hp. platform cage electric hoist recently was installed at one of the shafts of the Alden Coal Co., at Alden, Pa. This machine operates in balance, lifting cars from a depth below the surface of 585 ft. The weight of the cage is 10,000 lb., the weight of the car when empty 3,100 lb. and the capacity load of the car 7,500 lb., making the total weight lifted 20,600 lb., or more than ten tons. To carry this load the rope provided has a diameter of 1¼ in. The hoist is designed to raise 500 cars per day of eight hours, the maximum rope speed being 1,375 ft. per minute (about 15½ miles per hour). The head sheaves are set at 8 ft. 8 in. centers. The hoist is so placed as to lift from the side of the shaft.

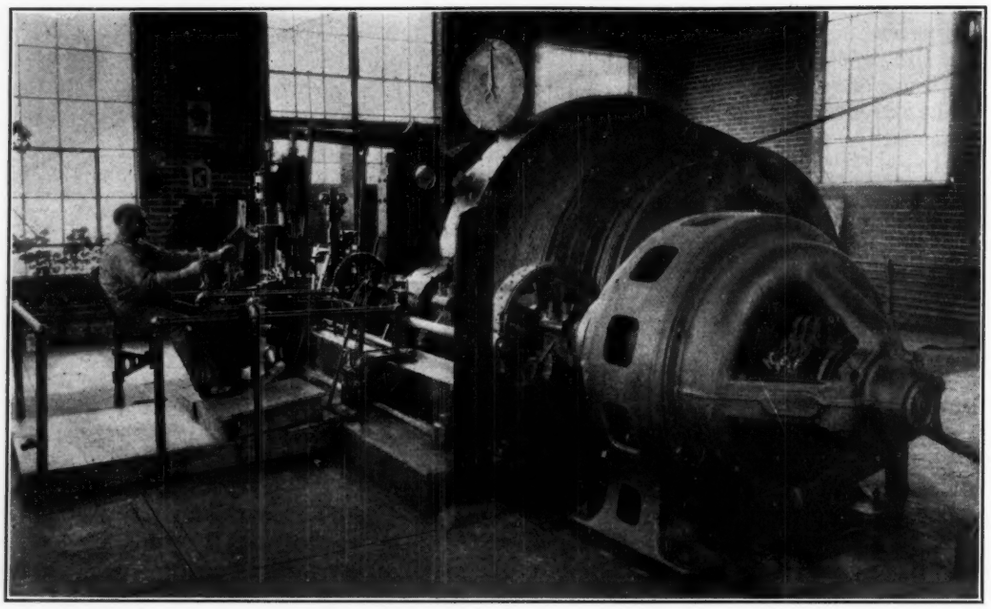
This hoist, which is of the geared type, is equipped with two cylindro-conical grooved cast-iron drums, varying from 7 to 9 ft. in diameter. Both are rigid on the drum shaft and driven by a slip-ring induction motor through a set of single-reduction herringbone gears. The drum grooves are arranged so that during acceleration the "up" rope winds onto the small diameter of one drum while the "down" rope unwinds from the large diameter of the other. This reduces the horsepower required at the peak of the load.

The bed-frame of the hoist has a bearing on the foundation throughout its entire length and is of "box" section. The three main or drum-shaft bearings have their housings cast integral with the side and center members of the bed. These bearings are of the wedge-adjusted type, the pinion-shaft bearings are of ring oiling pattern, and all have removable babbitted shells. A forged-steel shaft supports the drums and the main gear, which is keyed to the shaft close to the center bearing and also is bolted to one of the drum spiders.

A power-operated parallel-motion basswood-lined post type of brake operates on a suitable path on one of the drums, while an auxiliary asbestos-lined band brake operates on the pinion shaft. This auxiliary brake is interconnected with the power-actuated drum brake, the mechanism being such that both are operated simultaneously by action of the brake engine. Means for regulating the braking effort is provided so that the pinion-shaft brake is not called upon to assume an undue proportion of the load.

Brakes Act at Once if Anything Goes Wrong

The engine for the power operation of the brakes is of the vertical air-released weighted type provided with an oil cataract to insure smooth action. It is controlled for service braking by a hand lever, with the manipulation of which the motion of the engine is coincident. The engine also is equipped with a solenoid device which automatically causes a release of air from the cylinder, allowing the weights to apply the brake when power



Alden Coal Co.'s Hoist

This hoist, lifting 500 cars in eight hours from a depth of 585 ft., has two cylindro-conical grooved drums, the grooves being so arranged that the "up" rope winds onto the small diameter of one drum while the "down" rope wnids off of the large diameter of the other, thus reducing the peak load.

fails or when the current supply to the solenoid is interrupted by the action of the Vulcan safety device with which the hoist is fitted. Details of the combined brake engine and safety apparatus are such that the hoist cannot overtravel in either direction, the operator cannot start the hoist the wrong way at either limit of travel, and the machine cannot back away in case of failure of power or overload.

The hoist cannot overspeed from any cause whatever in any position of travel, nor in the prevention of overspeeding can the power brake be so suddenly applied as to cause an abrupt or violent stop such as might possibly break the hoist rope or cause other serious accident to life or property.

The operator must properly retard the hoist in approaching the landings or it will be stopped automatically. The machine will not start if, upon return of power after its failure or cessation, the operator has carelessly left the control lever in the "on" position. The hoist will stop if the control circuit becomes grounded or if the operator fails to keep the power brake and its posts in proper adjustment.

No costly delay in hoisting occurs after emergency stops. Should such a stop be made the operator is not endangered by flying levers, for there are none. The safety features are not dependent upon the will of the operator, but he can make an emergency stop if necessary by throwing a switch provided on his platform for that purpose. Travel limits and speed ranges are easily adjustable.

Air for the operation of the brake engine is provided by a small motor-driven air compressor having an automatic control consisting of a pressure regulator whereby the compressor cuts in at 60 lb. and out at 90 lb. pressure. A constant supply of air is thus maintained in the reservoir.

The hoist motor is a Westinghouse 440-volt 3-phase 60-cycle 585-r.p.m. continuous-rated slip-ring induction machine. It is joined to the pinion shaft by a flexible coupling and is mounted on a sub-base which is secured to the hoist bedframe. The control is of full-magnetic type, built by the Westinghouse company.

This machine also is equipped with a depth indicator, steel gear guards, operator's platform and a trip recorder of the Webb type. The gears are of Falk manufacture. The Vulcan Iron Works, of Wilkes-Barre, Pa., designed and built the hoist. The motor and control apparatus was installed by the Penn Electrical Engineering Co., of Scranton, Pa. A roomy, well-lighted and adequately ventilated building houses the entire outfit. The contactor panels are located in a room separate from that in which the hoist is installed.

Rhodes Fuel-Purchase Bill Reintroduced and Referred to House Mines Committee

REPRESENTATIVE RHODES of Missouri has reintroduced in slightly modified form his bill providing for the purchase of all coal and other fuel for all government services throughout the country, which has been referred to the Mines and Mining Committee, of which he is chairman. He also has reintroduced his bill for the purchase of land now occupied under lease by the Government Fuel Yard in Washington.

The bill providing for the uniform selection and purchase of coal and other fuel for use by the federal government directs the Bureau of Mines to select and contract for all coal and other fuel required by any branch of the federal service at Washington or elsewhere in the United States. A proviso is added that the selection of coal and other fuel may be made direct by any branch of the service "upon approval of the director of the Bureau of Mines." The bureau is authorized by the measure to make analyses and tests of coal and other fuels and to make investigations of fuel-burning equipment of branches of the federal service and their methods of handling, storing and using fuel, and to recommend changes in equipment and its use in the interest of fuel economy. Federal branches are directed, on request of the bureau, to furnish information relating to their fuel burning equipment, fuel consumption and fuel use as may be requested.

The bill also authorizes the bureau to contract for the purchase of coal and other fuel for the federal service in advance of the availability of appropriations for payment thereof, but not exceeding the necessities of the current year. Branches of the federal service are authorized to purchase under contracts made by the director of the Bureau of Mines in April, May and June of each year such coal and other fuel for their use during the following fiscal year as it may be possible to store at points of consumption. For administration of the act $250,000 is appropriated, through payment to the bureau of not exceeding 5c. a ton for each ton of coal purchased, analyzed or tested for each branch of the service.

Ayrshire's Oakland City Shaft Hoists Coal in Cages Built to Dump Gateless Cars

Will Readily Hoist Fifteen Tons Per Minute—Weight of Cage Being Always on Rope, Peak Power Is Not Needed for Starting—Dumping Is Always Successfully Accomplished, Avoiding Peak Common in This Operation

By Donald J. Baker
Wilkinsburg, Pa.

At NO. 8 mine of the Ayrshire Coal Co., at Oakland City, Ind., where the No. 5 bed of coal is being developed, self-dumping cages are, and will in the future be, employed to discharge the contents of solid-body mine cars, this company being among the first to utilize equipment of this type.

Heretofore operators have looked somewhat askance upon cages designed to discharge gateless cars. Most coal producers have preferred skip hoisting with rotary dumps underground or have adhered to the old form of endgate car, which can be discharged only by releasing or lifting the gate. In some cases, particularly in airshafts where men and material must be handled, non-tipping cages have been installed from which it is necessary to remove the car before its contents can be dumped.

The solid-body car has many and obvious advantages. These are so numerous that most operators would gladly adopt this type of equipment were they entirely satisfied that such a car could be as successfully and easily dumped as is a car with a lifting endgate when hoisted on a self-dumping cage. Many coal producers, however, are already of the opinion that this is being accomplished. Mines that were already equipped with the older type of cage have installed these solid-body car self-dumping cages as have also others having an output that does not warrant installation of a hoisting skip with a revolving dump at the shaft bottom.

Discharge Is Easy, as in Any Revolving Dump

The cage installed at the mine above mentioned not only permits the use of solid-body cars but provides for the discharge of their contents so easily and with such absence of shock that little degradation or breakage occurs. For reasons to be explained later the amount of power necessary for hoisting is lessened by the elimination of the peak load which usually comes upon the engine in starting the hoist and in dumping.

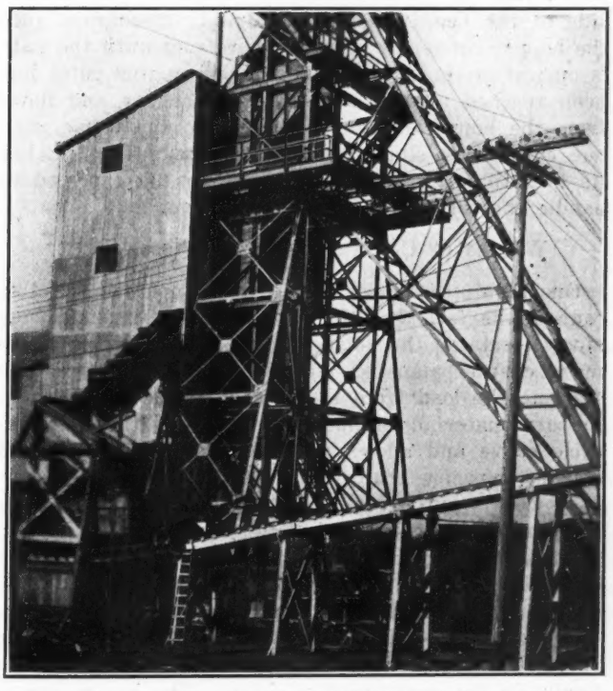
The shaft at the Ayrshire company's mine is only about 100 ft. deep, but the cages have to be lifted a distance of 150 ft. The car employed has a length of 10 ft. over all, a width of 5 ft. and height of 3 ft. It has a capacity of three tons or more, depending on its topping. At the bottom the loads gravitate to a landing where they are held by steel horns, being released one by one by an automatic cager which feeds them to the cage.

When there the car rests in a cradle which is mounted inside a hopper having a hinged discharge gate. This cradle is built in the form of a hoist platform and thus the cage can be advantageously utilized for handling coal, men or material. The cradle is pivoted on heavy trunnion shafts placed upon either side. These shafts carry the dumping arms, which are fitted with rollers at their outer ends. As the cage approaches the dumping point these rollers, working in guides at the top of the headframe, rotate the cradle and the car upon it through an angle of 135 deg., thus discharging the contents of the car into the hopper within which the cradle swings. Both cradle and hopper are positively locked except when the cage nears the dumping point. By this means the cage is always available for handling either men or material from the surface landing when occasion demands.

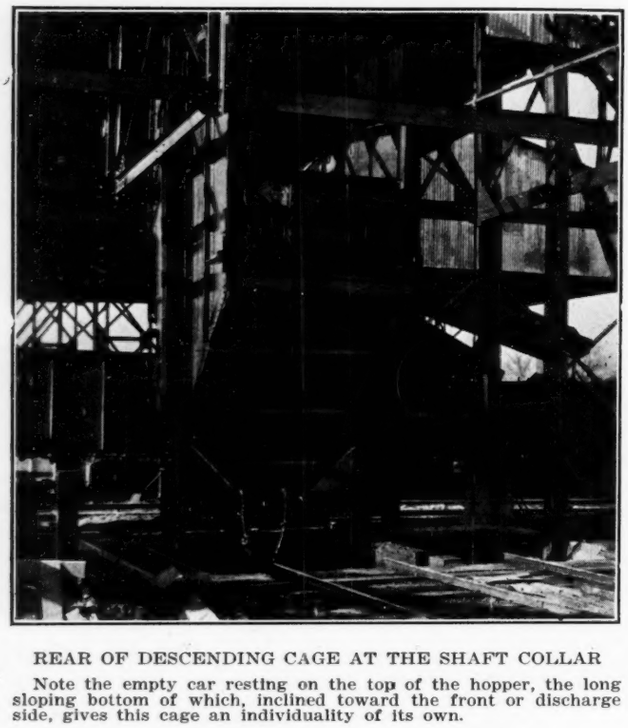
So Pivoted That Dump Takes Little Power

As the cage approaches the point of discharge the guides operate to unlock the hopper gate as well as the cradle on which the car rests. The rollers on the overturning arms then enter the main dumping guides, whereby the cradle is revolved easily and continuously without interruption until the car reaches its inverted position. As the cradle is pivoted at a point only slightly to one side of its center of gravity when loaded, the platform is so hung that the pressure on the dumping guides is almost negligible.

This is a detail of operation highly important from



NO. 8 TIPPLE, AYRSHIRE COAL CO., OAKLAND CITY, IND.
Shows the cage in the dumping position at the top of the headframe.



REAR OF DESCENDING CAGE AT THE SHAFT COLLAR

Note the empty car resting on the top of the hopper, the long sloping bottom of which, inclined toward the front or discharge side, gives this cage an individuality of its own.

the standpoint of power consumption. With the hopper located beneath the car it is possible to design the dumping guide with a long and easy curvature so that the overturning movement may be made gradual and smooth. Excessive stress or jar in the dumping operation is thus eliminated and the coal is spilled out of the car into the hopper in a steady and uninterrupted stream. A shield suitably placed protects the coal from excessive breakage.

When the hopper gate is unlocked, the unlocking occurring when the cradle is partly overturned, it is held closed by the action of the dumping rails at the side of the headframe. Coal already discharged into the hopper cannot be released therefrom until the gate is opened at the dumping point. When this point has been reached all the coal has left the car and flows from the hopper across the gate into the tipple with one continuous sliding motion. A cage that pitches its load into the dump hopper cannot be expected to handle the coal with as little breakage.

Weight of Car and Cage Always on Rope

One highly economical detail in the operation of this cage is the fact that the weight of the car and cage always rests on the hoisting rope. This gives a maximum counterbalancing effect, assisting the hoist in starting the load from the bottom of the shaft. This in turn materially reduces the peak of the hoisting-cycle curve and allows the installation of a hoist of smaller capacity than would otherwise be necessary. If power is purchased a reduced demand charge may be obtained from the power company on this account.

At the Ayrshire plant the hoist engineer does not have to operate his engine with a slack rope. The curvature of the dumping guide is so gradual that the cage can enter the guide at a fairly high rate of speed, being uniformly retarded until it comes to rest finally in the overturned position. The loaded car is fully discharged by the time the empty in the other compartment reaches the landing at the shaft bottom. It is never necessary to bring the engine to a stop before the cage enters the dump and then to resume operation in order to pull it and the car to the dumping position, losing meanwhile the counterbalancing effect of the empty cage. Time thus is saved and the capacity increased. Power cost also is lessened, as no severe peak load comes upon the engine.

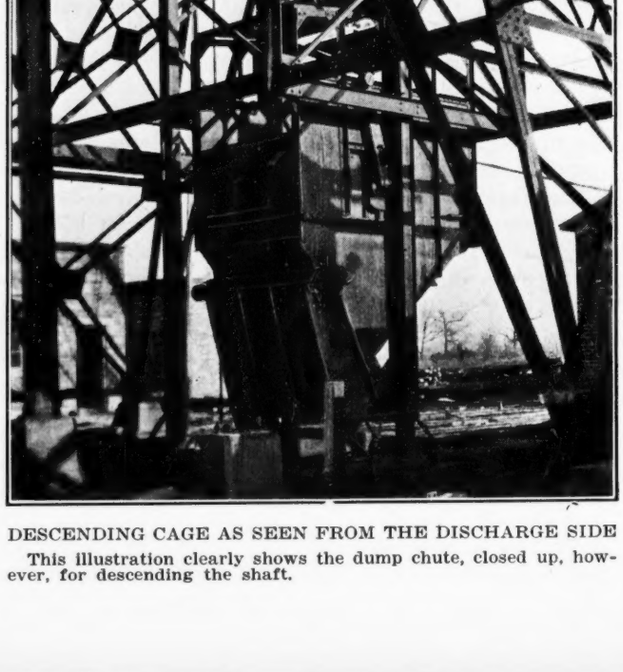
Capacity Realized and To Be Attained

The cages in use at this operation, which were manufactured by the Car Dumper & Equipment Co., have not as yet been employed to their full capacity. This has been because construction work has been in progress at the shaft bottom. Sufficient results have been achieved, however, utilizing a single cage to furnish an interesting comparison with the older type of self-dumping equipment. An average of two trips per minute with one cage can be attained easily. When both cages are put in operation the hoisting of four cars per minute may be confidently expected. For all practical purposes the hoisting capacity mentioned above is being maintained. Four cars per minute, if reasonably topped, are equivalent to fifteen tons of coal hoisted and dumped.

One of the disadvantages formerly charged to this type of equipment was slowness of operation as compared with the older self-dumping cage. From the record of performance at the Ayrshire No. 8 shaft it would appear that this difficulty has been entirely surmounted.

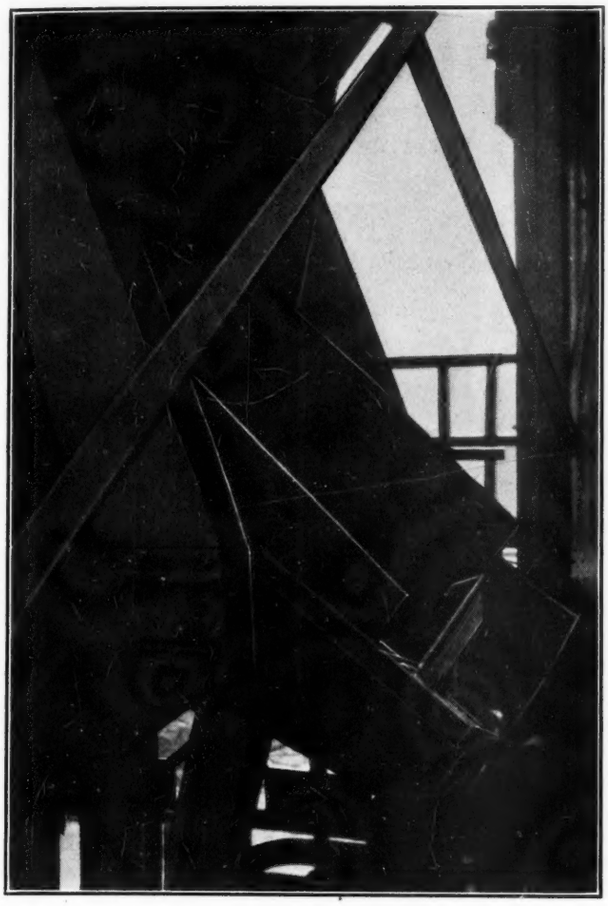
New Cages Insure Never-Failing Discharge

The Ayrshire Coal Co. has operations at other points in Indiana, some of which are equipped with the older and better-known types of self-dumping cage. It has been found that the new cages effect economies in operation other than those already mentioned. Among these are positive and never-failing discharge. The success of the older type, as this firm has learned, is dependent upon the endgate hook invariably engaging the crane in the upper portion of the headframe.



DESCENDING CAGE AS SEEN FROM THE DISCHARGE SIDE

This illustration clearly shows the dump chute, closed up, however, for descending the shaft.



DUMP CHUTE OF CAGE IN DISCHARGING POSITION

The coal has passed out of the hopper over the chute and onward to the tipple. The chute will be automatically lifted back into place by the roller on the track in the lower right-hand corner of the photograph, and locked by the action of the second roller.

Cars with loose or ill-fitting endgates often have their hooks out of alignment, with the result that an appreciable amount of time is lost and still more annoyance is caused by the crane missing its connection with the car hook. When this occurs it is necessary to lower the load and hoist it into the dump again.

This, of course, requires an excessive consumption of power. From actual tests made at large Indiana mines covering a period of two years it was found that 10 per cent of the cars missed the crane on the first trial and had to be taken into the dumping position a second time. The solid-car self-dumping cage, of course, entirely obviates this difficulty.

TWO MEN WORK OUT OF TURN; STRIKE ENSUES.—Dering Mine No. 6 in the Clinton (Ind.) field was closed down recently, the mine workers refusing to work because two of the employees had been allowed to work out of their turn. One morning the men arrived at the tipple and learned there that these two men had been favored with more than an equal share of work. They walked out at once and refused to return until the mine officials were ready to make an agreement. The Dering Mine is one of the largest in the Clinton field, employing about 300 miners and daymen. The mine was marked up for work and has been operating steadier than any of the other mines.

BIDS WILL BE OPENED by the Indian Office May 5 for 50,000 tons of bituminous and 2,000 tons of anthracite coal for Indian schools and agencies for the next year.

New-Inman Colliery Has Two Hoists Lifting Coal Twelve and Fifteen Hundred Feet

BY DEVER C. ASHMEAD
Wilkes-Barre, Pa.

AT INMAN, PA., a new mine is being opened by the Lehigh & Wilkes-Barre Coal Co. Work here has been progressing for some time, two hoisting shafts have been sunk to place and more or less development has been made in both the Hillman and Baltimore beds, which measures are reached by one of the shafts. The other shaft extends downward to the Red Ash vein. In this lower bed little development has been made, efforts having been concentrated on operations in the Hillman and Baltimore measures.

From present indications the equipment when finally completed will form one of the most modern installations in the anthracite field. Only a portion of the necessary machinery has, as yet, been installed, this including the two steel headframes, one engine house and part of the boiler plant. A temporary engine, the one used in sinking, is now employed at the Red Ash shaft. This opening is now utilized chiefly as an airshaft and for hoisting water.

The engines serving the other shaft are of modern and almost identical design. The Hillman bed lies 1,221 ft. and the Baltimore 1,522 ft. below the surface. The loads to be handled by these hoists are identical and may be enumerated as follows: Car, 3,000 lb.: coal, 7,000 lb.; cage, 6,000 lb. A carload of rock will weigh 8,000 lb., hence the total weight to be hoisted when the car contains coal is 16,000 lb. and when the car is filled with rock is 17,000 lb.

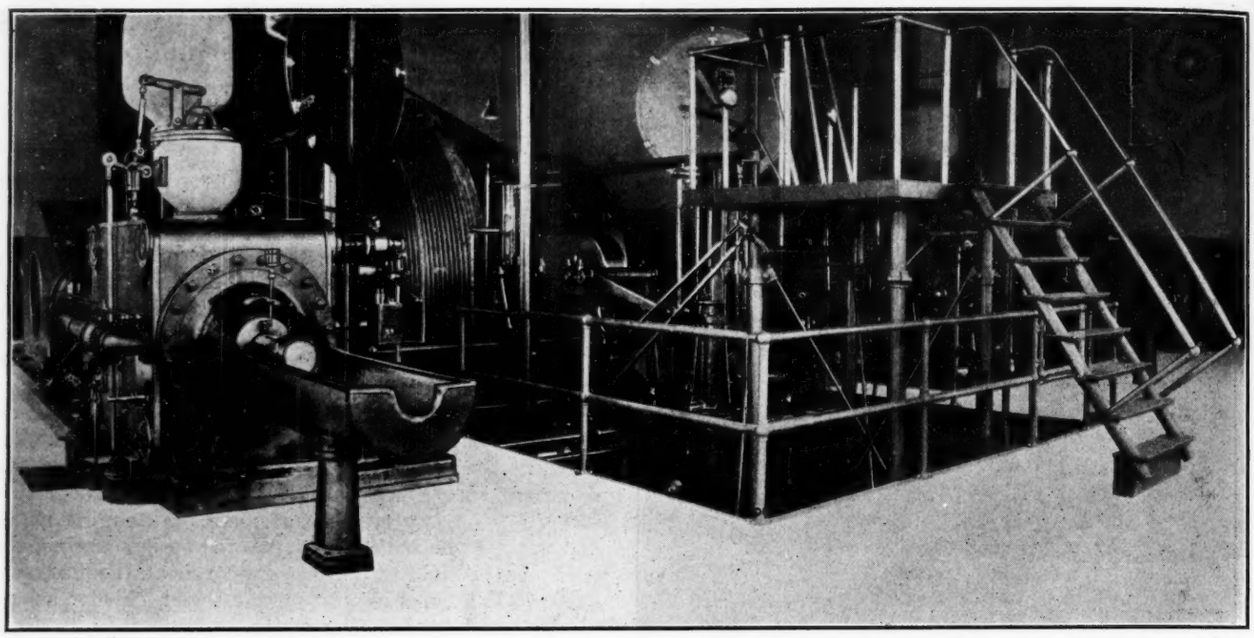
CAPACITY OF 1,192 CARS A DAY POSSIBLE

Thirty-three seconds will be required to make a coal hoist from the Hillman bed and forty-two seconds from the Baltimore bed. With a caging period of ten seconds it will thus be possible to raise sixty-nine cars from the Baltimore and eighty cars from the Hillman bed per hour. Accordingly, in a day of eight hours the maximum capacity from the two beds will be 552 cars from the Hillman and 640 cars from the Baltimore, making a total of 1,192 cars from both measures. Of course, these figures represent the maximum possible, and in practice doubtless will be subject to many deductions on account of unavoidable delays.

Both the engines installed at this shaft were built by the Nordberg Manufacturing Co., of Milwaukee, Wis., and with the exception of their drums they are identical. Their cylinders are 32 x 48 in. in size. The drums are conical, that hoisting from the Hillman bed being 10 ft. in diameter at the ends and 14 ft. in diameter in the center. The hoist serving the Baltimore bed is provided with a drum 10 ft. in diameter at the ends and 15 ft. in diameter in the middle. Both are grooved for 1½-in. rope.

Both engines, of course, are simple twin direct-connected machines. They work on 150 lb. steam pressure and are fitted with Corliss valve gears, tail guides, and Welch overwinding devices. The brakes are of the gravity-operated post type. The total weight of the engine serving the Baltimore bed is 335,000 lb., that of the Hillman machine being 325,000 lb.

The building which houses these engines is quite large as compared with other engine houses. Its dimensions are 56 x 97 ft. The walls are of brick and the roof is built with steel trusses and covered with as-



HOIST AT INMAN COLLIERY WILL LIFT COAL FROM BALTIMORE BED 1,522 FT. BELOW THE SURFACE

Using 150 lb. of steam pressure and being regulated by Corliss valve gears, the 32 x 48-in. steam engine will lift to the surface sixty-nine cars per hour, the total weight lifted when hoisting coal being 8 tons and when rock is hoisted being 8½ tons.

bestos shingles. The doors and window sash are of steel. For convenience in making repairs or doing other work upon the engines a trolley beam is provided over each. As the two hoists are installed near together a brick wall has been placed between them so that signals to the hoistmen may not be confused, as unquestionably might be possible otherwise. Such a confusion of signals might result in serious accident.

The accompanying illustration shows the engine that raises coal from the Baltimore bed. As has been stated, however, the two hoists are identical except in the size of the drums. This photo gives a fair idea of the size as well as the general ruggedness of these machines.

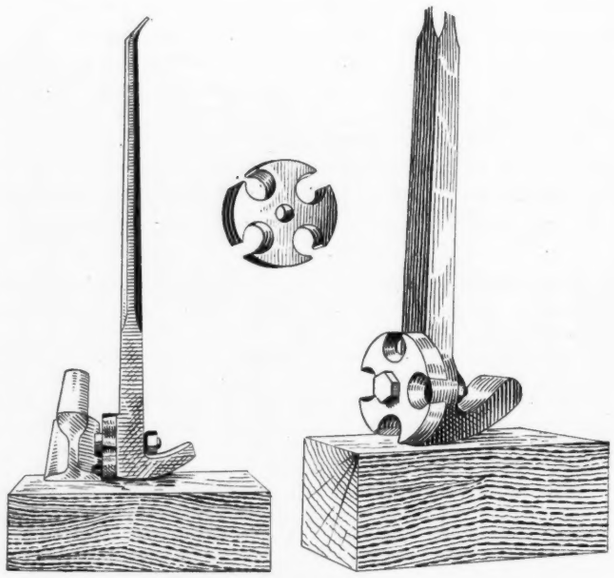
Spike Puller Has Four-Grip Disk That Pulls Spikes Without Deforming Them

THE ordinary forked spike bar has many shortcomings chief among which probably is the short lift it affords. A secondary drawback, however, lies in the fact that the spike-pulling claw is forged integral with the bar itself, and this, being made of mild steel, cannot be tempered or hardened so as to resist indefinitely the severe usage to which it invariably is subjected.

In order to obviate these difficulties the American Hinge Co., of Memphis, Tenn., has developed the spike puller shown in the accompanying illustration. Instead of the usual single integral claw this new bar carries a disk of properly tempered tool steel in the periphery of which are four tapered slots or grips the sides of which straddle the spike under the head. A foot projects from the opposite side of the bar and acts as a fulcrum when pulling. This gives such a large-radius path to the lifting effort that the spike is raised almost vertically throughout its entire length. In withdrawal, therefore, the spike is not bent or deformed in any way and is in condition for immediate use in new track.

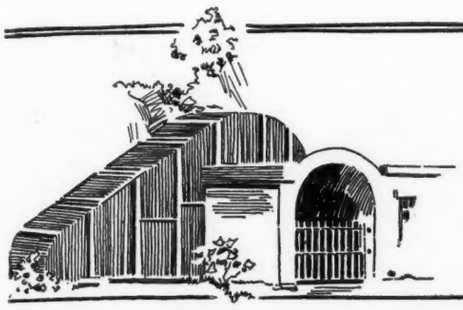
This tool has many advantageous details of construction. A light blow on the end of the fulcrum causes the disk slot to grip the spike firmly close under the head. Driving upon the upper end of the bar is entirely unnecessary, and this end accordingly may be preserved as a pinch. Should any particular slot in the disk become worn or unsuited to the withdrawal of a certain size of spike, rotating the disk through 90 deg. brings a new slot into position. When all four slots become worn so as to be useless it is unnecessary to buy a new tool, as only the disk requires renewal.

This puller is now available in two sizes, one adapted to spikes measuring $\frac{5}{8}$ x 2½ in. and $\frac{3}{8}$ x 2½ in. It weighs 6 lb. The other will lift ½ x 4-in. spikes and weighs 13 lb. Interchangeable disks, although made of the best quality of steel available and consequently long-lived, are comparatively inexpensive and may be renewed at small cost.

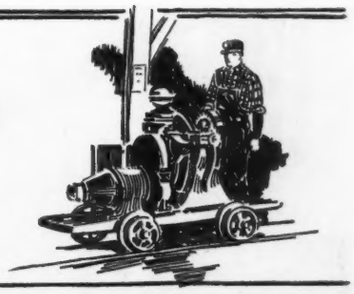


SPIKE BAR WITH TOOL-STEEL GRIPPING DISK

Bar is so constructed that it lifts almost vertically and so does not deform the spike. The grip, being of tool steel, keeps its shape under the stress to which it is subjected.



Ventilation and Pumping



Kempton Fan Has Inclined Evasé Opening With Bearing on Skeleton A-Frame

A RECENT mine fan installation made by the Davis Coal & Coke Co., at Kempton, Md., is shown in the accompanying illustration. R. P. Maloney is vice-president and general manager of this company, which has its headquarters at Cumberland, Md. The fan itself is a seven-eights housed double-inlet reversible Sirocco machine arranged primarily to operate exhausting. It is belt-driven from an induction motor.

As may be seen in Fig. 1, this fan is provided with an inclined evasé stack. This is an important detail because by this arrangement when the fan is changed over from an exhauster to a blower the direction of the air current is only slightly altered, whereas with a vertical fan stack the change in direction of air flow would amount to about 90 deg. It is, of course, highly advisable, where air travels at a velocity as high as that attained when issuing from a fan of this kind, to arrange for changing its direction as little as possible when shifting over from exhausting to blowing, or vice versa, as the expenditure of power in unnecessary work is thereby avoided. The less the resistance offered to the entry of air into a fan and the more easily it can be discharged therefrom the greater will be the power left available for actual mine ventilation.

For similar reasons the mouth of an airshaft should be provided with a curve of ample radius at the inner edge and the hood over the shaft either should be curved gently or be inclined at about 45 deg., so as to deflect the air leaving the shaft to the side drifts of the fan as easily as possible.

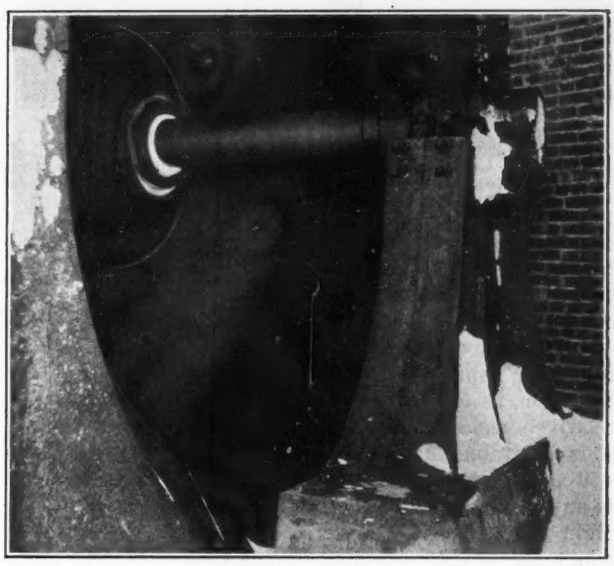


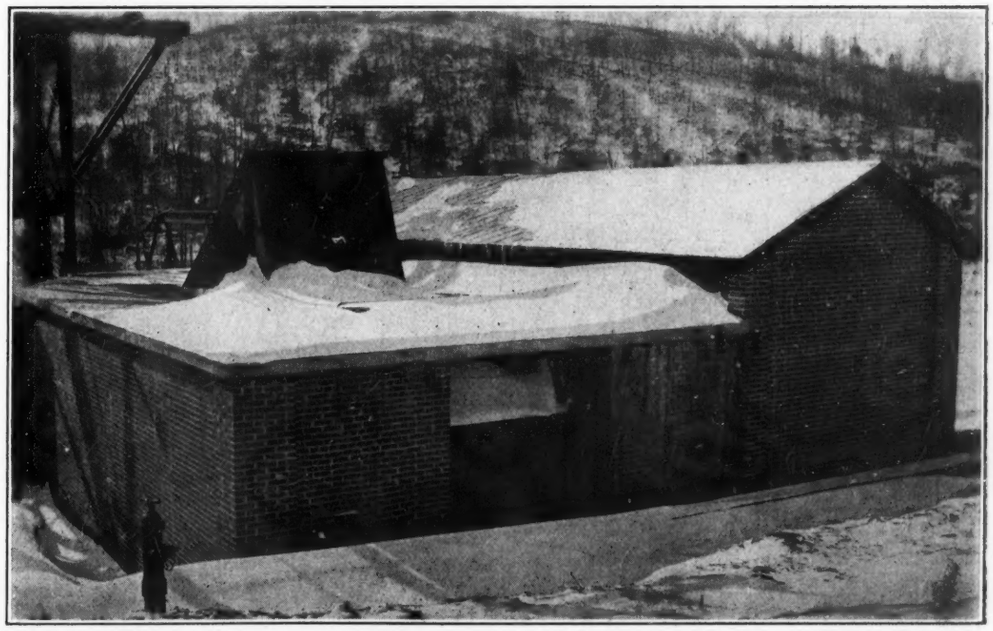
FIG. 2. SIDE VIEW OF MINE FAN

By making the bearing pedestal of skeleton form the air has plenty of room to enter the eye of the fan. The bearing is adjustable both vertically and horizontally.

Fig. 2 is a view taken from one of the side drifts. The fan bearing is so mounted as to be adjustable both horizontally and vertically. This is desirable, as it renders it easy to keep the fan bearings in line regardless of any slight subsidence that may occur. The

Fig. 1 Kempton Fan House

Note the inclination on the evasé stack which projects from the top of the fan building. It is usual to set such stacks vertical, but when the fan is changed from exhausting to blowing, the air must take a right-angled course, and that involves a loss in power which is largely avoided where the stack is inclined.



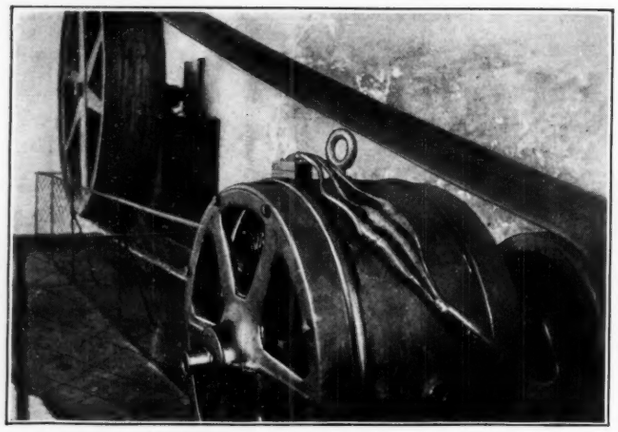


FIG. 3. MOTOR, BELT DRIVE AND FAN PULLEY

The duty to be performed by the fan being light, the fan pulley can be safely overhung, as in this case, and it will still give satisfactory running conditions. A larger fan would require the shaft to be lengthened for another bearing.

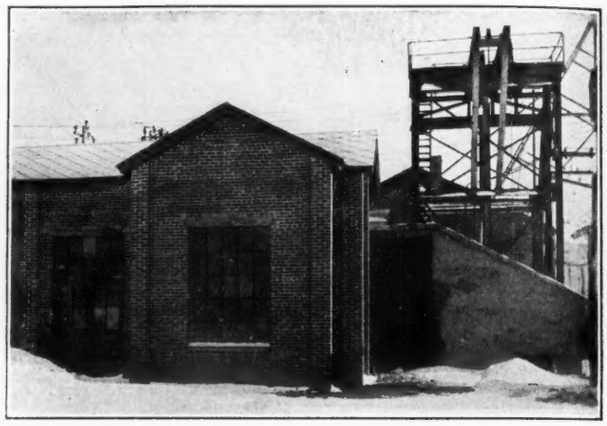


FIG. 4. FAN AND FAN-MOTOR HOUSE

The fan is built primarily as an exhausting machine, but the door being open shows that it is being operated as a blower drawing in air from the surface and not from the shaft, thus availing itself of the advantages of an inclined stack.

bearing in this case is supported on a skeleton A-shaped cast-iron pedestal, so that small resistance is offered to the flow of air, which may thus enter the fan eye both around and through the bearing support.

Fig. 3 shows the motor, belt drive and fan pulley, the latter being overhung, which is not an undesirable condition, as the horsepower transmitted is in this case relatively small. When a mine fan performs heavy duty it is desirable to provide an outboard bearing, which will satisfactorily take the pull of the belt. Fig. 4 is an exterior view of the fan and motor house. At the right may be seen the concrete hood over the airshaft, which is provided with a sloping roof. In the right foreground, also, will be noticed one of the fresh-air inlet doors. This door being open shows that the fan was being operated as a blower at the time this photograph was taken. It was, therefore, drawing the air from the atmosphere and discharging it into the mine.

The fan is provided with a double-inlet impeller 10 ft. in diameter and 5 ft. wide at the periphery. The contract duty is 155,000 cu.ft. of air against a mine resistance equivalent to a 1½-in. water gage. The speed is 110 r.p.m. and the power consumption was guaranteed not to exceed 49 brake-horsepower delivered to the fan shaft. The equivalent orifice of the mine as figured by Murgue's formula is as follows:

$$EO = \frac{.0004 \times \textit{volume handled in cubic feet per min.}}{\sqrt{\textit{water gage}}}$$

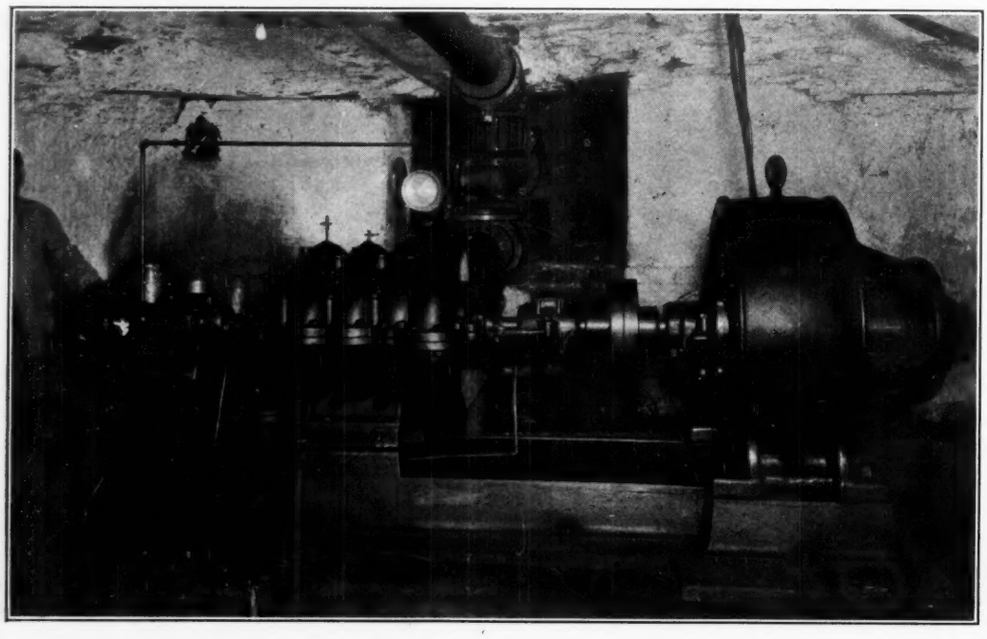
Solution of this equation shows that this equivalent orifice is 50.6 sq.ft. in area.

Centrifugal Pump Runs Over Twelve Years Without Needing Any Repairs

BY DEVER C. ASHMEAD
Wilkes-Barre, Pa.

WHEN a piece of machinery performs exceptionally difficult work in a coal mine the service rendered becomes of interest to the whole industry. Mining conditions are so exacting that in order to withstand them any piece of machinery necessarily must be of an exceedingly rugged type. Furthermore it must be properly cared for.

So far as pumps are concerned, however, there are times each year when the pumping capacity of the mine is taxed to the limit. Then in case of a breakdown to one of these machines, parts of the mine are liable



Centrifugal Pump

Because only traces of sulphuric acid are to be found in the water which this pump handles and because of the excellence of its design it has run for a dozen years without a cent's expenditure for repair, lifting water 375 ft. from the Orchard vein at the rate of 800 gallons per minute without rest night or day.

to damage by flooding. Furthermore the liability of pumps to damage is greater, as they are installed underground and operated by artificial light, which makes the detection of wear less easy and repair more difficult. Again, the class of labor employed to operate pumps is not as skillful as the drivers of hoisting engines and consequently these men are not as well fitted to meet the difficulties encountered as a more skillful attendant would be.

With these considerations in view it is well to note a particularly successful centrifugal pump installation that is being operated in the No. 1 shaft of the Kingston Coal Co. at Kingston, Pa. This pump is installed in the Orchard vein and delivers against a head of 375 ft. It is a Janesville machine of four stages, with an 8-in. discharge, and has a capacity of 800 gallons per minute. It is driven by a direct-current Westinghouse motor, which has a horsepower of 125.

This pump was installed on Oct. 1, 1908, since which time it has been in continuous service. It has thus been in operation for a period of slightly more than twelve years and a half. During this time not one cent has been expended for repair, replacement of parts, or labor upon the pump proper. Night and day throughout this period the pump has handled its 800 gallons of water per minute. A little trouble has been experienced with the motor, but only such as may be expected from a machine of this kind operating in a damp place.

The water that this pump handles is not ordinary mine water as this term usually is understood but is practically spring and ground water containing only a slight trace of sulphuric acid. Furthermore no grit or dirt is present to eat the impellers. It is interesting to note that with these favoring conditions the pump has given service that might be regarded as exceptional.

By Movement of a Rotor Three Spaces Enlarge and Contract, Thus Drawing and Expelling Water

Triangular Impeller Revolves Within a Square Rotor to Which It Imparts Motion—As They Revolve Spaces Are Formed Which First Enlarge, Forming a Suction, and Then Grow Small and Act as a Compression Chamber; Thus Water Is Sucked in and Voided by the Pump

PUMPS now being used in mines may be classified roughly into two main basic types, namely, plunger or reciprocating, and centrifugal machines. The turbine type may be included in the second classification, although its action is not quite the same as that of the centrifugal. Because of the inherent disadvantages heretofore found in the rotary type of pump its use in the mining industry has not been extensive.

Mining engineers generally concede that, mechanically, both plunger and centrifugal pumps leave much to be desired from the standpoint of general efficiency. In the former an exceedingly close fit is necessary between plungers and cylinders, and the resulting rubbing and wear quickly bring about excessive slippage. Then again the inertia of the whole volume of the head of water must be overcome before maximum efficiency can be obtained.

Centrifugal and turbine types of pumps are weak in creating suction and are not positive in action. They cannot profitably be used for any conditions differing in any essential from those for which the particular pump was originally designed. It follows, therefore, that if a rotary type could be evolved which incorporated the positive action of the plunger pump with the continuous flow of the centrifugal or turbine type, the ideal in mine pumping efficiency would be attained. The rotary types thus far evolved may be divided broadly into the following classifications: Those using the meshing gear movement, those of the rotary plunger type and those of the rotary bucket and packing-strip types. In practice all these develop more or less friction between either the moving parts themselves or between the moving parts and the casing.

The Exeter rotary mine pump built according to the Feuerheerd patents is based upon an entirely new idea in rotary-pump construction. This pump creates its own suction, its action is positive, and the flow of the water is continuous. There are no valves and no reciprocating parts to get out of order, while, compared with its output, the size of the pump is remarkably small. Because rolling rather than rubbing action takes place between its surfaces, the wear has been reduced to a minimum.

Broadly speaking, the underlying principle is a variant of the square-hole drilling device in which a triangular bit functions inside a restraining square

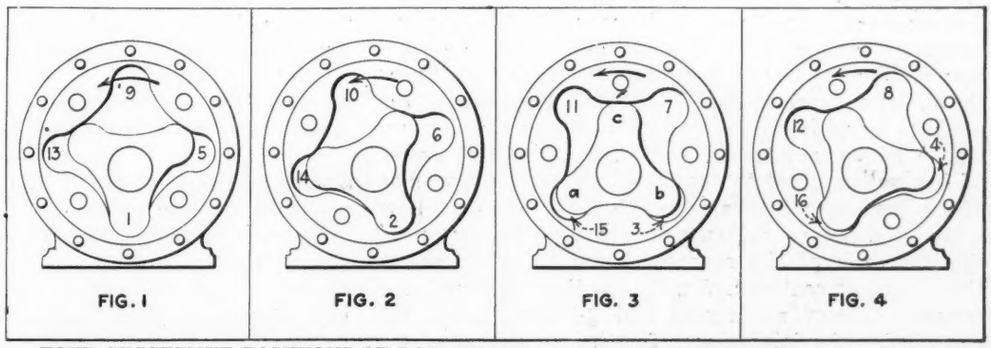
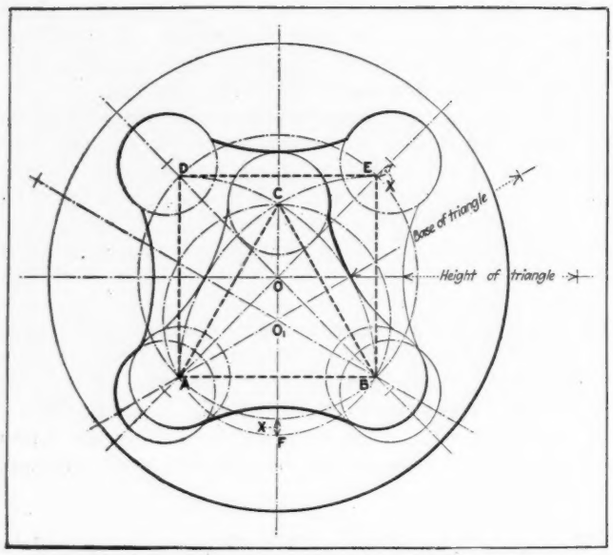


FIG. 1 FIG. 2 FIG. 3 FIG. 4

FOUR SUCCESSIVE POSITIONS OF ROTATING PARTS SHOWING SIXTEEN PROGRESSIVE SHAPES OF PUMPING POCKETS

Pocket 9 in Fig. 1 becomes 10, 11 and 12 in Figs. 2, 3 and 4. Again looking at Fig. 1 it has become 13. It gradually reduces till it becomes 16, and, going back to Fig. 1, it is seen to have disappeared altogether. After which it gradually develops from 1 to 9. While it is decreased in size it is discharging the water that it contains under pressure; as it increases it is taking in water by suction.



METHOD OF DETERMINING ROTOR SHAPES

The two parts are built around an equilateral triangle and a square on an equal base. Both are enlarged by circular additions at their angles and by curved processes which join the circles.

former of equal size. This combination has been developed as a three-tooth pinion meshing with an internal four-tooth gear, the two being set eccentrically one to the other. The irregular spaces, increasing and diminishing in volume as the two parts rotate together, are utilized to admit and eject the fluid. Using an equilateral triangle inside a square will, of necessity, give the largest spaces for a given size of the contacting pair. Any other combination—four to five, five to six, etc.—will more nearly approach equal size and consequently leave smaller voids.

It is obvious that true geometrical forms would not function smoothly. The next step, therefore, was to evolve by experiment such a series of curves on both members as would enable continuous contact to be maintained without jar and assure a smooth rolling motion between the parts. It is of more than passing interest to note that the solution found employs only circular arcs.

The accompanying illustrations, Figs. 1 to 4, show the two rotating elements in sequence of position during one complete revolution. Fig. 5 illustrates the geometrical construction employed in the design of the two rotors.

Considering Fig. 5 first, an equilateral triangle *ABC* and a square *ABED*. The angles of the triangle are bisected and the lines produced; the diagonals of the square also are drawn and produced. The circumscribing circles of both triangle and square also are drawn. It will be seen that at the bottom of the figure the circles cut each other and that *X* is a measure of the distance by which the two circumscribing circles overlap. With the points of the triangle as centers, circles with a radius equal to one-fourth of the common side of the triangle and square are described. With *O* as a center and *OF* as radius, arcs are struck intersecting the diagonals of the square. From the four points thus found as centers and with a radius one-fourth the common side of the square and triangle, circles are described. The joining arcs for the completion of the square figure are struck with the height of the initial triangle as a radius, and the similar arcs on the triangular figure are described with the side of the square or triangle as a radius.

The first center found is upon the vertical center line, and the arc contacts with the extreme top of the triangular figure. The explanation is more involved than the actual construction, which, if a pair of compasses are used, may easily be followed from the diagram and the foregoing description. The only variation from the geometrical figures found as above described is that the sides or outlets of the recesses in the square figure formed as above are made parallel, so that the projections on the inner figure enter and leave more easily.

We will now consider Figs. 1 to 4 in sequence. In Fig. 1 the space *9* between the two rotors is at a maximum. The inlet port has just closed and the outlet port is about to open. The entire cycle of movement and variation of one space can be progressively followed through the four diagrams by the numbers *1* to *16*. Starting with maximum volume as *9* in Fig. 1, then going to *10*, *11*, *12*, *13*, *14*, *15*, *16*, *1*, *2*, *3*, *4*, *5*, *6*, *7*, *8*, and *9* completes the progression. The capacity of the pump per revolution is equal to three times the volume of space *9*.

The pump consists of an outer casing of cylindrical form which contains a pair of rotors meshing, the inner rotor being keyed to the driving shaft. These two rotors are set eccentric one to the other, the axial line being at the intersection of the bisection lines at *O* in the geometrical diagram, Fig. 5. The outer rotor has four ports which open to both the suction and discharge during rotation. These ports are closed momentarily by a lip at both the top and the bottom of the pump body in order to effect the cut-off between the suction and the discharge of the pump. The liquid is drawn into the machine through the ports of the outer rotor while the size of the pocket is increasing, and is forced out at the opposite side of the pump during the last half revolution when the size of the pocket is decreasing.

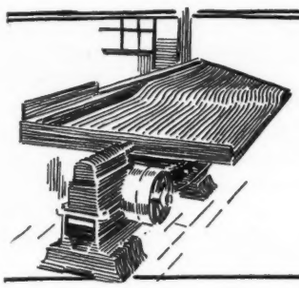
The rotors themselves are acid-resisting bronze castings of suitable thickness, worked on edge to the figures described, their faces or ends being in parallel planes. The outer rotating member is a working fit in the casing at its periphery but is otherwise free. The inner rotor imparts motion to the outer.

Two Rotating Parts Have Equal Speed

The chief defect common to the rotary pumps heretofore developed has been that, because of local differences in speed, wear was irregular. Rotary pumps have been built of great initial exactitude for high duty and extreme conditions, but such accuracy has heretofore been highly difficult to maintain for any length of time because of the variation mentioned. This trouble is common to each of the three general types of rotary pumps referred to, and there is no simple method of compensating such irregular wear.

Hydraulic engineers of wide experience assert that reciprocating motion is preferable to rotation in a positive-acting pump. In the Exeter rotary pump this objection is minimized if not entirely eliminated for all practicable purposes. This is due to the maintenance of rolling action throughout.

Pumps of this kind are self-priming, easy of installation and can be readily adapted to every dewatering condition found in the mining industry, from the smallest gathering to the largest mine-drainage pump. Dirt and grit do not seem to affect the pump inasmuch as there is no rubbing or sliding contact. Small pumps thus far tested have shown a sustained volumetric efficiency of 98.67 per cent, and an over-all efficiency of between 70 and 82 per cent.



Surface Machinery

Method of Washing Coal for Metallurgical Coke at Risco, in Birmingham Field

Coal Crushed to One-Inch and Under, Jigged and Delivered at Steel Plant with Only Six Per Cent Moisture Without Use of Drainage Tanks or Centrifugal Driers—Water Clarified for Re-use Contains Only Fifteen-Hundredths of One Per Cent Solids

By E. P. Stewart
Chicago, Ill.

THE Birmingham coal field of Alabama has long been noted for the careful attention it gives to, and the progress it has made in, the art of coal washing. Though a number of plants are devoted to the preparation of clean, well-sized domestic fuel, by far the greater number and the more elaborate coal-washing installations have been made with a view to producing coal for coking purposes with the lowest possible ash and sulphur content. In recent years the larger companies in this district have constructed byproduct plants which have called for extreme care in cleaning and preparation.

What probably is one of the latest and most completely equipped plants for the preparation of coking coal is to be found at the Risco tipple and washery of the Republic Iron & Steel Co. This is located at Risco mine, about twenty miles northwest of Birmingham, near Palos, Ala. A general view of the tipple and washery may be seen in one of the accompanying illustrations. This plant contains the best of modern means for handling and treating coal from the time it leaves the mine until it is loaded into railroad cars for shipment to the coke ovens. Unusual attention has been given to the cleaning, screening and crushing of mine-run before it is delivered to the washery, to the separation of coal from its accompanying impurities in the washery, to the drying of the washed product and finally to the prevention of loss of fine coal, this last result being effected by the clarification of the water used in the washing process with attendant recovery of fine material.

Ash Eight Per Cent, Sulphur Below One

The coal measure mined and treated is known as the Mary Lee bed. In the vicinity of Palos this is somewhat lower in ash content than at other points in the immediate district and after treatment in the plant it yields a high-grade coking product containing approximately 8 per cent ash and less than 1 per cent of sulphur. Moisture in the washed coal as shipped is less than 10 per cent. This is further reduced in shipment so that by the time the coal reaches the ovens it does not contain more than 6 per cent of moisture. The tipple and washery are designed for a capacity of 250 tons per hour.

Mine-run coal is delivered in solid-body cars to a rotary dump in the tipple by means of an endless rope haulage. After the cars have been disengaged from the rope they are fed at regular intervals to the platform scale and dump by a car feeder which is under control of the weighman. The mine-run coal is subjected to a

STEEL TIPPLE AND WASHERY OF REPUBLIC IRON & STEEL CO., AT RISCO, ALA.

careful treatment designed to furnish a material not only of a uniform size but one thoroughly hand-picked before crushing. Coal is discharged from the pit cars by the dump into a large concrete receiving hopper and thence fed out uniformly onto a Marcus screen. This screen removes all of the fine coal that will pass through a 1-in. circular perforation and offers facilities for complete removal by hand-picking of all coarse rock, sprags, or other refuse which might damage the coal crushers. This refuse and rock is thrown into a steel trough attached to the screen and conveyed by it to the rock and waste bin, while the coal finer than one inch passes direct to the conveyor which leads to the washery.

Washer Coal Crushed to One-Inch Diameter

Mine-run coal larger than one inch freed from rock and refuse is delivered from the Marcus screen into a crusher so set as to reduce it to a maximum size of one inch. The coal after passing through the crusher is collected and elevated to a special set of shakers and rescreened, the oversize returning to the crusher. The 1-in.-and-under coal passing through this special screen meets the fine coal previously mentioned as coming from the Marcus screen and is conveyed with it to the washery. It should be noted that no coal can reach the washery that has not actually passed through a 1-in. circular perforation.

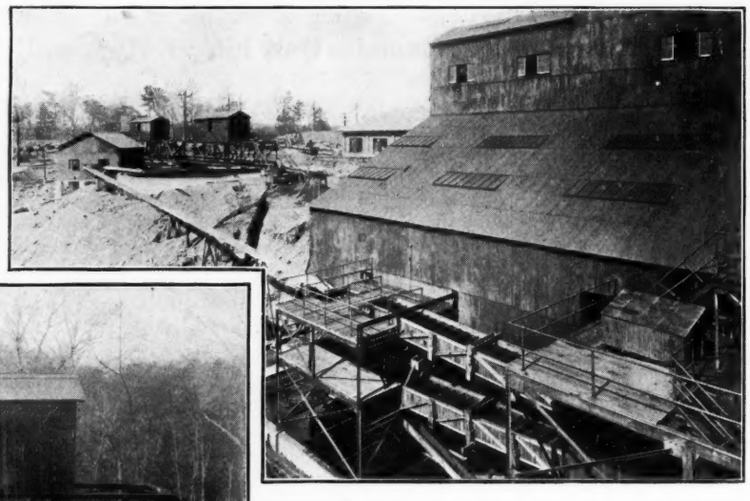
In addition to the coal-preparation equipment described above the tipple contains interesting means for inspecting cars containing an excessive amount of rock, for which the miners are docked. Cars to be inspected are directed to a second rotary dump and discharged to a feeder and inspection table. Movement of the feeder and inspection apron is so timed that the contents of the car is spread evenly over the full length of the table. After the necessary inspection and picking the coal is discharged onto the Marcus screen, where it mingles with that delivered from the main rotary dump.

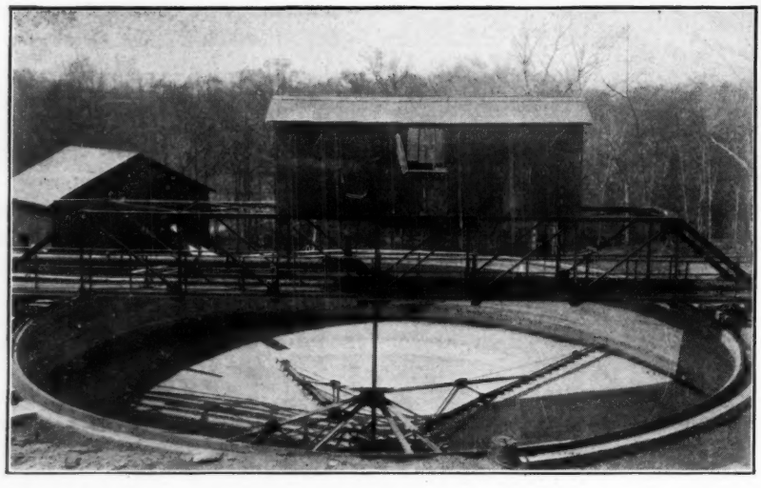
A conveyor leading from the screen to the side of the tipple permits the loading of picked mine-run coal direct into railroad cars, when for any reason this is desirable. At times a few cars of rock are brought out of the mine along with those loaded with coal. To dispose of this rock, by-passes have been arranged in the hopper beneath the second rotary dump above mentioned. When this rock is discharged it is deflected direct into the rock bin which receives the pickings from the Marcus screen.

The 1-in. coal leaving the tipple is transported by means of belt conveyors to a large storage bin located behind the jigs in the washing plant. At this point the equipment contains an interesting and rather unusual feature in that the coal may be screened if desired and the dust eliminated from the washing process. The screens employed for this purpose are located above the bin and are provided with ⅜-in. circular perforations. When these are used the fine material removed is conveyed to a bin and thence to the final washed coal conveyor, where it mixes with the washed product. The oversize is deposited in the bin and fed out to the jigs.

Outside View of Washer

Showing the draining conveyor. The coal in its movement passes over a finely-perforated trough which retains the coal but lets the water through, which then returns to the sludge recovery. The water goes to overflow tanks and thence to the Dorr thickeners in the background.





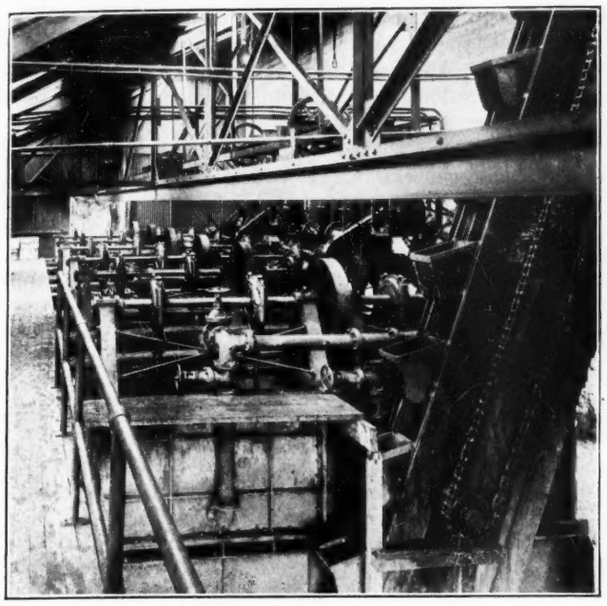
One of Two Thickeners

Rakes in the bottom of the thickener revolve once in two minutes and with their plowlike blades move the fine coal toward the center, whence it is withdrawn by a diaphragm pump, the product being half coal and half water.

At present the plant contains three two-compartment coal-washing jigs with provision for the future installation of a fourth. The arrangement of these machines, as well as the general layout of the operating floor in the washery, is shown clearly in the accompanying illustration. The jigs are constructed of cast iron and equipped with specially-designed rotary valves for the removal of bone coal and refuse as well as special valves in the bottom for the withdrawal of fine hutch products.

Jig Compartments Built of Cast Iron

The coal is fed uniformly from the bin to the jigs by rotary feeders, each jig and feeder having a normal capacity of seventy-five tons per hour. Each jig and the feeder serving it constitutes a separate motor-driven unit. Any number of these units may be operated at



JIG FLOOR SHOWING CAST-IRON JIGS

On the opposite side of the walk facing the jigs are the various motor controls by which all the machinery in the washer is handled.

will. It is not necessary to describe the two-compartment jig. It should be noted, however, that cast-iron jigs as employed in this plant not only assure great rigidity and absence from vibration but offer unusually long life and great desirability. They are not subject to the excessive corrosion frequently attending operation of similar equipment when used in acid water such as is often encountered in coal-washing installations.

The jigs produce three products, viz: clean washed coal free from rock and bone, bone coal suitable for boiler fuel, and refuse containing but little combustible matter. These products are directed by suitable sluiceways to the necessary tanks, dewatering elevators, and conveyors. The washed coal finally is deposited in the shipping bin and the refuse in the waste bin.

Gray Band Crushed and Rewashed in Jigs

The bed as mined at Risco is peculiar in that it contains a gray band of very hard, heavy coal, low in ash and high in fixed carbon. Some of this material is discharged with the high-ash bone coal from the jigs. To prevent loss this bone is first dewatered and then crushed and rewashed in one of the primary jigs.

Means and methods used in this plant for dewatering the washed coal are somewhat of a departure from the usual practice and have proven highly effective. The arrangement of the draining conveyor employed in the process will be noted in the illustration of the outside of the breaker. All the washed coal and water from the jigs is first sluiced to a revolving screen having $\frac{3}{8}$-in. circular perforations. The coal retained on this screen passes direct to the final washed coal conveyor leading to the shipping bin.

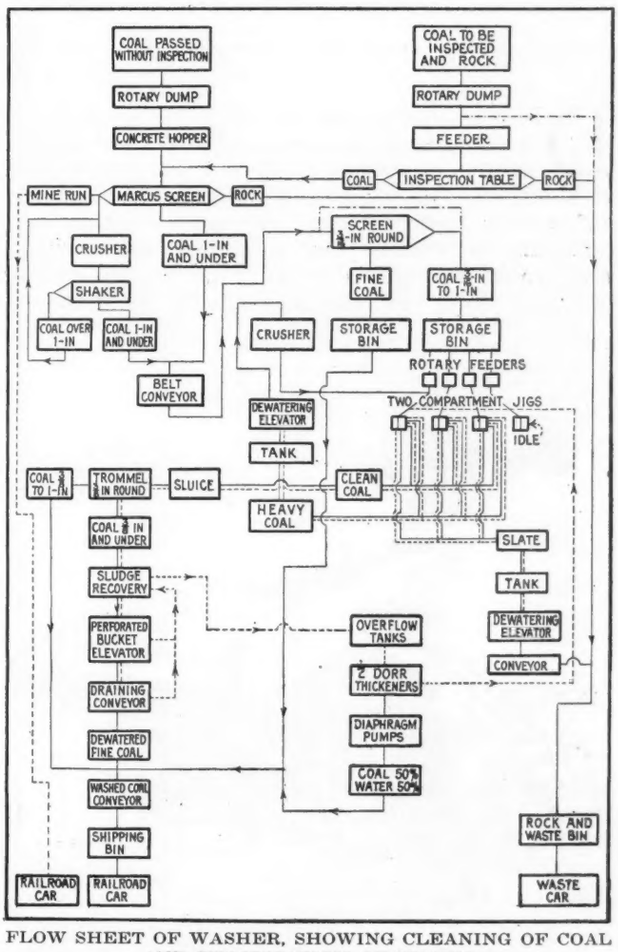
The finer material or that passing through the screen, together with the water, flows to a standard sludge-recovery apparatus. This is a long rectangular tank fitted with a slow-moving flight conveyor designed to move the coal, as it settles, to the pit end of the recovery tank. From here it is withdrawn by a perforated-bucket elevator.

This fine coal taken from the sludge recovery is discharged by the elevator onto a draining conveyor. It is here that thorough dewatering of the fine coal takes place. The draining conveyor is similar to the well-known flight conveyor except that it has a finely-perforated trough. As the coal is dragged along this trough the water passes through, finding its way back to the sludge recovery. The dewatered coal finally is discharged from this conveyor into the washed-coal conveyor mentioned previously. This conveyor also receives the oversize material from the revolving screen in the beginning of the drying process.

Water Clarified in Thickener for Re-use

The water kept in continuous circulation in the process of washing, amounting to approximately 3,500 gal. per min., is subjected to clarification. The cycle of operations here followed represents one of the latest advances in the art of coal preparation. The general arrangement and details of construction of the Dorr thickener are well known, but to those still unacquainted with them the details may be noted in the accompanying illustration.

After overflowing the various tanks and having been collected in a central container the water is sent by centrifugal pumps to two Dorr thickeners each 70 ft. in diameter. The water entering these thickeners contains from 4 to 6 per cent of solids. It overflows the periphery of these tanks into sluices and is led back to the jigs, to be again used in the process of washing.



FLOW SHEET OF WASHER, SHOWING CLEANING OF COAL AND PURIFICATION OF WATER

The coal is first reduced to one inch and under and then taken to the washer, where the fine coal ($\frac{1}{8}$ and under) may be taken out before washing. Washing is done in two-compartment jigs. Dashes in the drawing show permissible routes for the coal and dotted lines the course taken by the water in its various degrees of clarification.

This water as it leaves the thickeners contains about 0.15 of 1 per cent of solids, being practically clear.

The thickener tanks have cone-shaped bottoms and are fitted with centrally-located vertical shafts to which are attached slow-moving rakes. These scrape on the bottom and conduct the fine material, as it settles, to the center of the tanks, whence it is withdrawn by diaphragm pumps. This fine coal, or sludge, as it is termed, consists of approximately 50 per cent solids and 50 per cent water.

After being discharged by the diaphragm pumps it is conducted by a sluiceway to the final washed-coal conveyor, where it is mixed with the other washed products and delivered to the shipping bin. It will be seen that this method not only precludes possibility of any loss of fine coal but enables the washing process to be conducted with practically fresh water at all times.

The plant throughout is of fireproof construction, all structures and buildings being of structural steel covered with corrugated sheet roofing and siding. All tanks are of reinforced concrete. Ample protection is afforded the operatives through the use of safety guards everywhere. All machinery is electrically-driven, the controls being located at the most convenient points for the operation of the tipple and washery equipment.

In conclusion it should be stated that special interest in this plant centers in the modern and somewhat unusual features employed for the preparation of coal before washing, the washing process proper, the means employed for dewatering the washed product, the facilities for by-passing the fine coal without washing, and finally, the clarification of the circulating water and recovery of the coal dust.

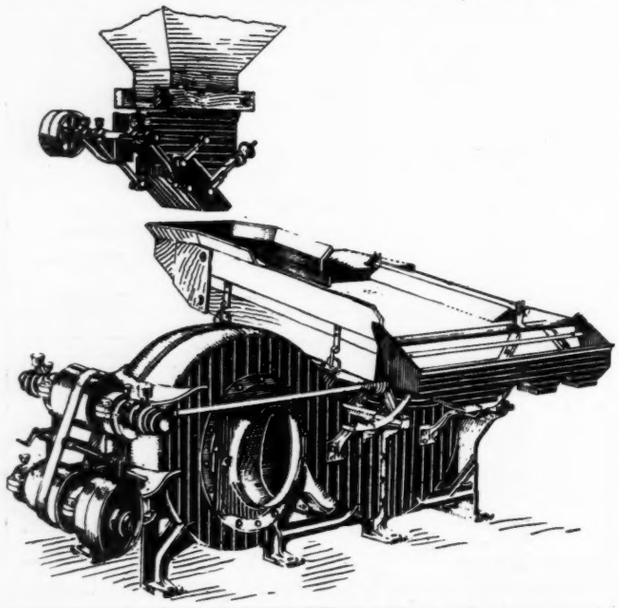
The plant was designed and built by the Roberts & Schaefer Co., of Chicago, in close consultation with F. G. Morris, general superintendent of coal mines for the Republic Iron & Steel Co. It has been in operation for the past two years, and as the mine development proceeds it will become one of the company's most dependable sources for coal required in coke production.

Washing Coal with Air Instead of with Water

Air Forced Upward Through Table Deck and Its Load of Material Almost Immediately, Separates Light from Heavy Particles—Thus Machine Has a Large Capacity—Furthermore the Product Is Dry

By L. E. Woods
Welch, W. Va.

DRY cleaning of coal by means of air flotation is a comparatively new process for the demonstration of which a small plant has been erected at Welch, W. Va. In general the basic idea involved differs little from that employed in the ordinary concentrating table except that upward-moving air under pressure is employed as a separating medium instead of water. Both processes depend upon the difference in specific gravity between the coal and its accompanying impurities. The new method, however, not only uses air to accomplish the separation but applies it in a manner differing radically from that in which water is utilized.



CONCENTRATING TABLE WITH FAN FOR ITS OPERATION

To one corner of this table is delivered coal in any one of many narrow ranges of sizes. It is lifted by an upward flow of air and receives also, by the motion of the table, a thrust which forces it up hill along the deck. The heavier material is not lifted off the table and so receives the full effect of the thrust. The impure material therefore is propelled along the deck, and the cleaner passes across the riffles, gravity determining its passage.

The ordinary concentrating table is provided with a deck that is impervious to the water which is employed as a separating medium. Consequently this fluid must flow over the table surface in order to submerge the material forming the deckload and wash the lighter from the heavier particles. The deck of the new separator is pervious to air, and the separating medium accordingly is forced upward through the deckload, positively lifting the lighter elements away from the heavier. In this process the lesser weight of air as compared with water is much in its favor, as it greatly facilitates the speed of separation and increases the efficiency of the operation. With air the separation is practically instantaneous, with a corresponding effect upon the capacity of the machine.

Used Mainly on Fine Sizes of Material

This air separator is primarily intended for the finer sizes—that is, those pieces ranging from 1½ in. down to dust. As it is impossible to separate particles differing only slightly in specific gravity but varying widely in weight it is necessary to perform a certain amount of screen grading in order to obtain products in which the sizes of particles are not widely variant. Because of the comparatively small difference in the specific gravities of coal and slate a minimum of four sizes should be made in such material as has been named above, namely, 1½ to 1 in., 1 to ½ in., ½ to ¼ in. and ¼ to ⅛ in.

Practically all run-of-mine material that will pass a ⅛-in. perforation is of sufficient purity for commercial

purposes. This size (less than ⅛ in.) can, of course, be cleaned quite as readily as any other, but ordinarily this is unnecessary. The minus ⅛-in. particles may be eliminated by screening, leaving a material to be treated that ranges from ⅛ in. to 1½ in.

The air jig consists essentially of a body mounted upon inclined supports and oscillated by a pair of bronze eccentrics. An ordinary centrifugal fan is built into the base of the machine and supplies air to the body, which accordingly becomes an air chamber or windbox. The pervious or perforated cover to this chamber forms the deck whereon separation takes place. This receives the material to be treated, and the air moving upward through the small holes in the deck causes the particles to assume positions in accordance with their respective specific gravities.

Machine Closely Resembles Sludge Table

The deck proper consists of a frame provided with slats or ribs supporting the perforated cover. It has an area of 12.5 sq.ft., about one-third of which is taken up by the ribs, leaving a clear or net space of 9.3 sq.ft. A steel and cast-iron running gear is provided, so designed as to afford both longitudinal and transverse adjustment of the inclination of the deck. The toggles of this running gear are set at an angle of 35 deg. from the vertical. The body and deck are oscillated with a throw of 5.8 in. The speed is about 300 strokes per minute.

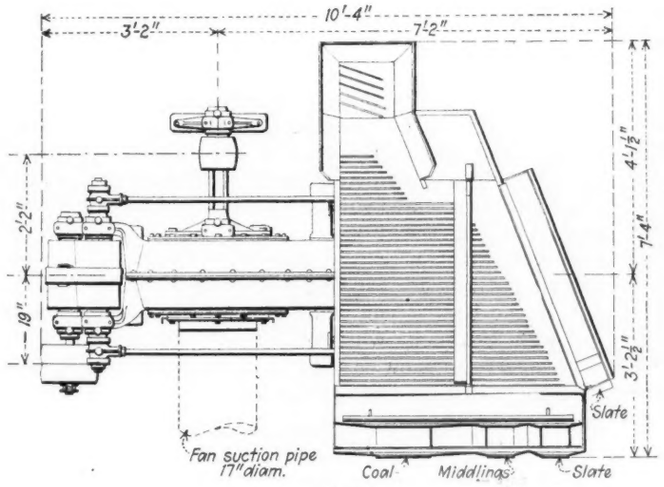
A speed-change device is built into the base of the machine. This consists of two parallel shafts bearing cones, set oppositely, with a belt under control of a shifter running between them. The eccentrics for the oscillation of the body and deck are fastened to one of these shafts. The constant-speed shaft makes 300 r.p.m., giving a speed range to the other shaft of from 270 to 330 r.p.m., which communicates to the body and deck an equal number of complete oscillations per minute.

The fan is a 40-in. steel-plate centrifugal suction-blower and is driven at 1,600 r.p.m. The eye or intake is provided with a gate to regulate the amount of air entering the machine, and consequently the volume passing the deck apertures.

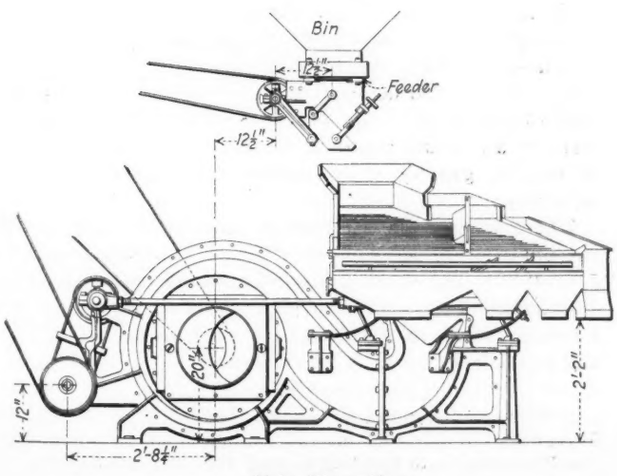
Cloth or perforated metal is used to cover the deck. In either case the porosity of the covering is suited to the size of the material being handled. Above the deck surface is placed a series of metal riffles, fastened to the ribs. These members are designed to retard the transverse movement of the load across the deck.

Table Inclination Adjustable to Suit Coal

Both longitudinal and transverse inclinations of the deck are adjustable to suit the size of particle being treated. The usual transverse setting is about 5 deg. from the horizontal, the deck sloping away from the feed. The longitudinal inclination is about 1 deg. from the horizontal, the slope being upward from the feed. The oscillating movement tends to thrust the load up the



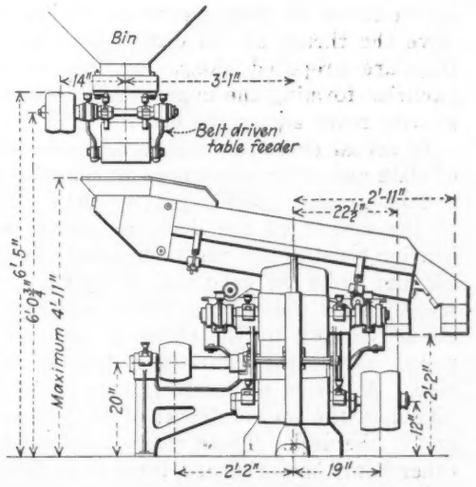
Plan



Side Elevation

Front and Side Elevations and Plan of Air Concentrator

Coal finds its passage unretarded by riffles and unhindered by the jolting of the table. It comes straight down the inclination, actuated by gravity, vaulting the riffles with the aid of the air current. Slaty material has to travel to the end of these obstructions to a point where a smooth surface permits it to move down by gravity to its point of discharge. Coal of mixed character, part slate and part coal, also is moved toward the smooth space at the end of the riffles, but fails to reach it. It ultimately lands at a discharge point between the coal and the slate.



End Elevation

longitudinal inclination, while gravity tends to carry the material downward laterally away from the point of feed.

Air from the fan enters the windbox below the deck at high velocity, the volume being regulated by the gate on the fan suction. This air is retarded in its escape by the perforated cover and the density of the deckload. It is thus compressed within the body of the machine and finally escapes through the deck cover in a multiplicity of fine streams. The volume escaping, of course, is governed by the amount admitted to the fan.

The velocity of escape is dependent upon the density of the deckload and the degree of compression existing within the cleaner body. Small particles require a small volume of air at high velocity and larger pieces require a greater volume at less velocity.

Screen Regulates Air to Suit Deckload

Within the air chest or body and below the deck is placed a perforated plate or air screen. This is designed to regulate the flow of air through the deck and to vary its pressure and volume to suit the requirements of the load. Thus an increased volume and pressure are obtained where the deckload is greatest or where the material composing that load is heaviest. Such varying zones of air pressure and volume facilitate the process of separation.

Passing the perforations of the deck under pressure the air immediately expands and forms a sheet or cushion above the deck surface under partial compression. This air film, controlled as to volume and density at different portions of the deck, supports, at least in part, the material being treated and forms the separating medium.

Coal to be cleaned is fed to the deck at one corner, namely, that forming the highest point of transverse inclination and the lowest point of the longitudinal inclination. It immediately encounters the upward flow of air, a positive thrust tending to propel the mass longitudinally—that is, up hill—along the deck, while the force of gravity tends to move the coal down hill across the deck. The air cushion facilitates the stratification of the material or its arrangement in regular gradation from the heaviest at the bottom to the lightest at the top, all particles arranging themselves according to their respective specific gravities.

Heavy Particles Move Lengthwise of Table

The heavier particles of the lower portions or zones are retarded in their movement by the riffles and receive the thrust of the deck vibrations. Accordingly, they are propelled along the deck while the lighter particles forming the upper strata, under the action of gravity move across the deck.

In actual operation the feed, consisting of coal and of slate and other substances detrimental to the product and of greater specific gravity than coal, is delivered to the corner of the deck, as above described. The heavier constituents are immediately submerged in the air film while the good coal is forced to the top of the mass. Thus the slate is forced upward and backward along the deck by the riffles to the end, and the coal moves across the riffles and deck to delivery at the side. A series of banking bars or obstructions are placed in the line of travel of the slate at the farther end of the deck. These receive and bank the slate and other heavy material and force it to the lower delivery side, thus forming a dense mass of slate over which the coal cannot pass. This action gives two zones of segregated materials—the coal discharged near the feed end of the deck and the slate discharged at the opposite end.

Table Works Most Rapidly on Larger Fines

The capacity of the cleaner varies according to the size of the material being treated. The amount that the machine will successfully handle increases rapidly from the smaller to the larger sizes of particles within the range of $\frac{1}{8}$ to $1\frac{1}{2}$ in. For all sizes the average is about six tons per hour.

An official test recently made on a sample of $1\frac{1}{2}$-in. screenings from the Pocahontas No. 4 bed weighing 56,600 lb. gave the results shown in the accompanying table.

ANALYSIS OF RAW COAL, CLEAN COAL AND REFUSE

	Raw Coal, 100.00 per Cent	Clean Coal, 94.59 per Cent	Refuse, 5.41 per Cent
Volatile matter	18.60	18.65	12.09
Fixed carbon	72.45	74.75	34.91
Ash	8.95	6.60	53.00
Total	100.00	100.00	100.00
Sulphur	0.84	0.83	1.20

ASH IN RAW COAL, CLEAN COAL AND REFUSE ARRANGED IN SIZES

	Per Cent of Size	Per Cent Ash in Raw Coal	Per Cent Ash in Clean Coal	Per Cent Ash in Refuse
On 1 in.	1.14	44.20	....	44.20
Through 1 in. and over $\frac{3}{4}$ in.	2.70	29.00	7.80	48.36
Through $\frac{3}{4}$ in. and over $\frac{1}{2}$ in.	4.66	20.96	9.29	55.77
Through $\frac{1}{2}$ in. and over $\frac{3}{8}$ in.	7.11	14.38	7.30	57.84
Through $\frac{3}{8}$ in. and over $\frac{1}{4}$ in.	7.40	10.72	5.91	51.44
Through $\frac{1}{4}$ in. and over $\frac{1}{8}$ in.	19.88	7.93	6.68	56.00
Through $\frac{1}{8}$ in.	57.11	6.48	6.48	.....
	100.00			

From the results thus obtained it will be noted that the efficiency of the machine is high. The ash content of the coal was reduced from practically 9 per cent to 6.6 per cent, with a reject of only 5.41 per cent of the material treated and with only a small amount of good coal in the tailings. Furthermore it will be observed that in this instance the impurities exist almost entirely in the larger sizes, everything remaining on the 1-in. screen being added to the tailings without any treatment whatever. Coal passing through a $\frac{1}{8}$-in. aperture likewise was not treated but was added directly to the cleaned product.

Invented for Cleaning Seeds and Grain

The equipment above described has been patented and is manufactured by the Sutton, Steele & Steele Co., Inc., of Dallas, Texas. It was designed originally for the cleaning and separation of seeds, cereals, nuts and legumes, in which operation it has proved highly efficient. It has also demonstrated its value in the separation and cleaning of fine ores and, in fact, for the treatment of any small granular material where a difference in specific gravity exists between the particles to be separated.

The machines themselves are simple and inexpensive in construction as well as efficient and economical in operation. The small plant maintained by the Central Pocahontas Coal Co., at Welch, W. Va., was built for purposes of demonstrating the machine and for testing any coals that may be offered.

Among the contracts signed Thursday, April 14, by Mayor J. Hampton Moore of Philadelphia was one with the Philadelphia & Reading Coal & Iron Co. for $55,000 for the furnishing and delivering of coal.

Rock Larries Build Their Own Dumps and Provide Economical Disposal

Dragline Scraper Not Only Limits Size of Rock Dump but Becomes Increasingly Expensive in Operation as It Gets Bigger and Higher—Electrically-Propelled Larry with Swinging Body Admirably Solves The Problem of Rock Disposal

By Dever C. Ashmead
Wilkes-Barre, Pa.

WHETHER the rock to be disposed of at an anthracite colliery comes from shaft or breaker its disposal often presents a serious and expensive problem the magnitude of which is likely to increase with the passage of time. Numerous methods for the disposal of this material are now employed. Sometimes it is crushed and flushed back into the mine as filling. Sometimes it is piled in large conical heaps by means of a dragline conveyor, which is extended from time to time as the pile grows. Sometimes the mine cars are run out on the dump, there to be discharged either by hand shoveling or otherwise.

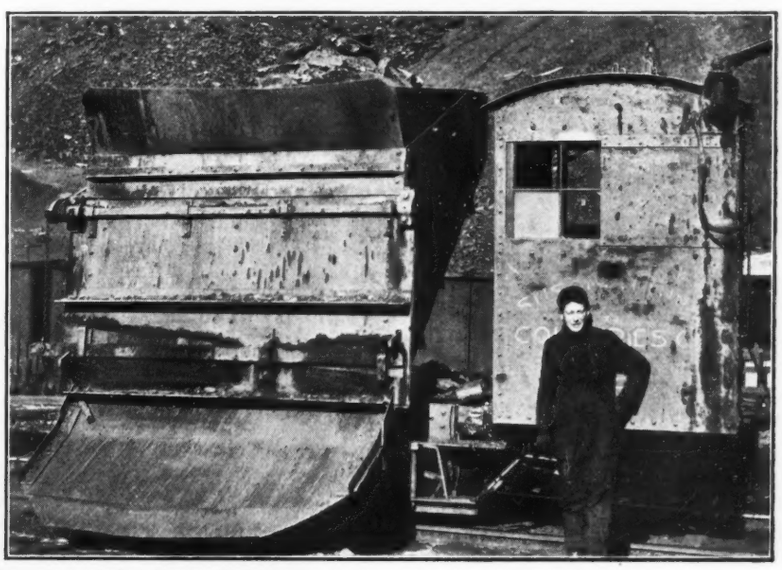
Many other methods have been adopted for disposing of this material but possibly the most satisfactory of them all is that employed by the Susquehanna Collieries Co. at its Pennsylvania colliery, near Mt. Carmel, Pa., where electrically-driven larries are employed for the purpose.

Prior to the introduction of these larries the rock was conveyed to the dump by means of a dragline scraper. This means of disposal became more and more expensive as time went on, as the height of the bank increased rapidly, thus not only lengthening the conveyor but also the height to which the rock had to be raised. These changes rapidly augmented the power consumed.

Dragline Too Long and Rock Pile Too High

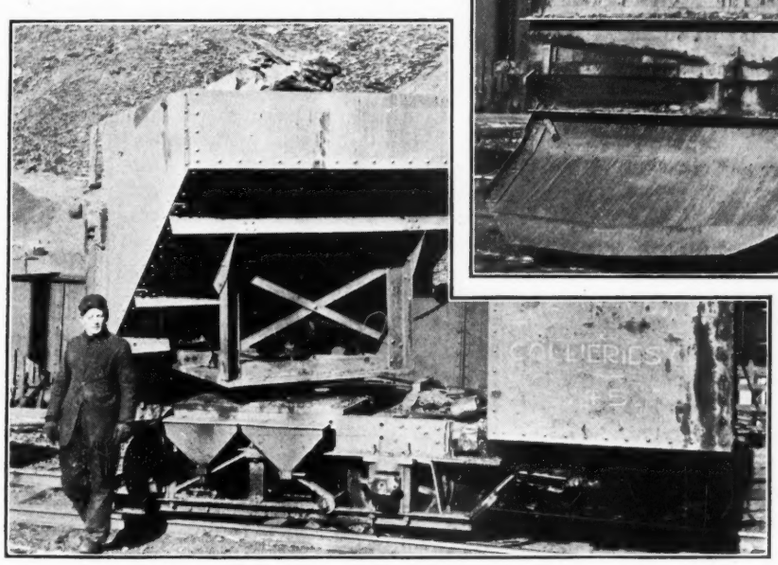
In a single day hundreds of tons of rock may have to be disposed of on the surface, and conditions, as outlined above, soon became intolerable. The rock-disposal problem is particularly serious in those portions of the anthracite field where the beds pitch steeply, as under such circumstances it is practically impossible within the mine to separate extraneous material from the coal. Where the beds are flat or nearly so most of the refuse can be picked out and gobbed underground.

One of the great difficulties in the formation of a rock dump on level ground is to secure sufficient height to take care of the material dumped. It is possible to run these larries up a grade of six per cent, and therefore in seeking to secure a satisfactory dumping height on ground which is not sufficiently irregular to provide a



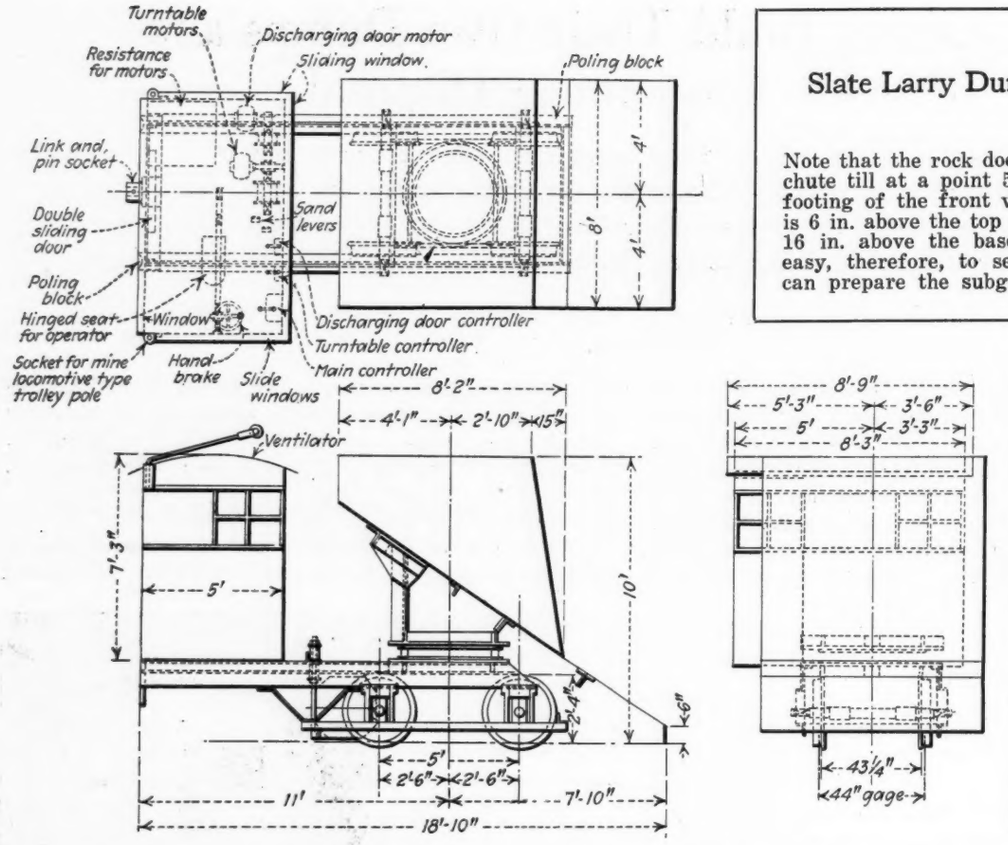
Side Dumping

When dumping from mine cars the rock does not have enough spread to make a good and permanent dump unless much rock is lifted out of the car, carried to the side of the dump and dropped over the edge. This larry widens its own dump as cheaply as it extends it.



Diagonal Dumping

Here again the larry provides for the immediate establishment of a dump that will stand satisfactorily up to the point of extension. The material also being in bulk, the bottom of the larry body being smooth and the grade of the bottom steep, the rock shoots into place and runs to a stable position.



Slate Larry Dumping Forward

Note that the rock does not leave the larry chute till at a point 5 ft. 4 in. beyond the footing of the front wheel. Even there it is 6 in. above the top of the rail and about 16 in. above the base of the ties. It is easy, therefore, to see how completely it can prepare the subgrade for a track extension. The objection to transportation of rock in mine cars is that when the rock gets to the dumping point it is hard to discharge, and the advantage of a larry would be comparatively small if in dumping it did not cast the material with force well away from the side of the track, making it possible to build up a dump that will not be forever sliding down and developing low spots.

level dump of adequate capacity, advantage can be taken of the ability of the larries to climb up to a considerable elevation in a short distance.

At the Pennsylvania colliery the rock dump attained such size that disposal by dragline became unduly expensive. No suitable place existed near the breaker where a new dump could be started. There was available, however, plenty of room for a dump of almost unlimited size just beyond the reach of such a conveyor.

Accordingly it was decided to handle the rock by means of larries. At the present time only breaker rock is disposed of by this means but arrangements are being made whereby rock cars from the mine may be discharged at the top of the breaker and their contents sent to a separate rock bin. From this point the material will be drawn into a separate larry for disposal. This arrangement will necessitate two machines but each may assist the other in case of need. The larry was built by the Connellsville Manufacturing & Mine Supply Co. and has a capacity of 10 tons when loaded with rock.

Success in this method of rock disposal depends much upon the type of larry used. The design in this case is in some ways exceptional, therefore attention may well be called to some of its special features. It is so designed that it may dump either forward or upon either side. This enables it to build its own roadbed as it advances.

Motors Move, Turn and Discharge Larry

The machine is electrically-operated throughout, being provided with four motors. Two (one on each axle) propel the larry, a third operates the turntable and swings the discharge to any desired position, and the fourth opens the gate. Controllers for these motors are located convenient to the operator.

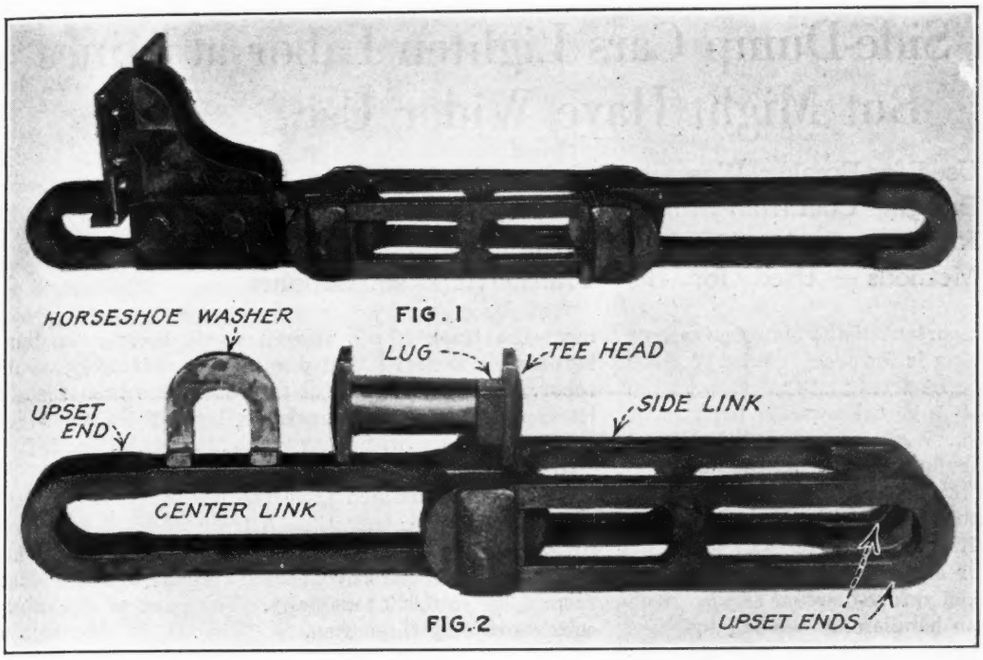
This type of larry reduces the necessary amount of track shifting to a minimum, and it is only necessary to extend track as the dump builds up. This in turn means that all track extensions may be made by the outside gang and that no regular force of men is needed on the dump.

Grades encountered, of course, are against the loaded larry, but these need not be excessive. One of the chief advantages of this system as compared with the dragline is that it requires less power. It naturally takes less energy to move rock horizontally than vertically; the rock also travels more easily when carried on wheels than when dragged along a piece of sheet iron. The rock may be carried a long distance by larry without the cost of rock disposal by that means even approaching the expense of operating a dragline, as this involves not only a large power expense but heavy depreciation.

Three Distinct Parts Form Conveyor Chain

ABOUT 115 miles of heavy-duty conveyor chain are in use in the anthracite region, being employed largely in the movement of culm to the breaker, refuse to the slate bank or silt to the dump. It is estimated also that more than 200,000 ft. of such chain is installed or renewed annually in this field alone. The work to which it is subjected is of the roughest and severest kind and, unless a chain is simply and ruggedly constructed, it will fail in a comparatively short time. Many sizes, types and varieties of chain for this purpose are now in use, and each succeeding year sees one or more new designs placed upon the market.

The latest and possibly the simplest design so far evolved is illustrated herewith. This is the invention of J. C. Law, of Scranton, Pa., and patents covering it have been applied for. This chain while intended pri-



Rivetless Chain

Fig. 1. Shows chain fitted with flight brackets and Fig. 2 two plain links. Resting on the chain may be seen a joint pin and a horseshoe washer, the latter being used only when the links are worn. The ends of the links are upset, so that the pin is held firmly in place as long as the links are not pushed together.

marily for use in the conveyance of anthracite materials may also be employed advantageously in industrial and manufacturing plants for the movement of almost any bulk granular commodity.

Both Links of Pair Have Enlarged Ends

As may be seen in the accompanying illustration, the chain in its simplest form consists of two kinds of links and one type of pin. Other forms adapted to the outside drive of the chain as well as various modifications in length of link or pitch may, of course, be employed. The illustrations here given, however, well depict the basic principle upon which the chain is constructed. The center link is of open pattern bossed, or upset, at the ends. This reinforcement takes the shape of an increased width of link upon both sides of the center line at either end. The side links likewise are upset at the ends, but the reinforcing boss here takes the form of an increase in width upon one side of the link—that toward the center line of the chain—only. The connecting pin is provided with a tee head on both ends, but on one end this head surmounts a rectangular lug extending from the side of the pin at right angles to the arms of the tee.

From the above it will be obvious that when the links at any joint are pushed endwise toward each other until the bossed ends unmask or clear each other, they may be collapsed or squeezed together sideways sufficiently to release the lug on the end of the pin from the grip of the side link. The pin may now be rotated through an angle of 90 deg. and withdrawn, the opposite tee head passing readily through the slots of the links. The reverse operation, of course, may be performed in fastening links together or building up a joint in the chain.

Horseshoe Washer Takes Up Wear in Chain

If in course of time excessive wear should occur at a chain joint, the links and pinheads wearing upon each other until appreciable transverse play develops, this wear may be taken up or compensated by the insertion of the open-sided washer, or "horseshoe," shown in the illustrations. This washer is inserted under the head of the pin opposite to the lug, the pin itself preventing movement in one direction, while the upturned ends, or "heel calks," bearing against the pin tee head prevent movement in the other. This effectually takes up any side wear on the links and allays any possibility of the pin lug failing to function.

As an example of the saving made possible by the use of this washer assume that wear on a 1,000-ft. length of 6-in. pitch chain has to be taken up. This length of chain contains 2,000 pins. If these are replaced by pins of a length shorter than the original they will cost about 20c. each, or $400. Two thousand of these washers, on the other hand, would cost about 3½c. each, or $70, showing a saving of $330 per 1,000 ft. of chain. On conveyors of larger pitch than the one above assumed the possible saving would be somewhat less than in the example above given, such saving being roughly proportional to the number of joints involved.

Attachments Easily Bolted to Center Link

Flight brackets or attachments of various kinds may be fastened to this chain. One form of these attachments is shown in the illustration. The particular type here depicted consists of two brackets formed to fit the center link of the chain, to which they are attached by two machine bolts passing through the link. A variety of flight shapes might easily be secured to brackets of this kind.

All parts of this chain except the washers and flight attachments (which are stamped and cast respectively) may be dropforged. They are thus comparatively cheap as well as strong and of easy and rapid manufacture. As may be well appreciated by those accustomed to the installation, use and repair of conveyor chain, this design is extremely simple. A small amount of slack on the take-ups permits the removal and renewal of any link that is dangerously worn. The building up of a new chain, of course, is quite as easy and rapid as the repair of an old installation. Another obvious advantage is that no tools of any description are necessary in either initial installation or repair.

Fifty-Ton Side-Dump Cars Lighten Labor at Mines But Might Have Wider Use

Used for Breaker Waste and Culm—Available Also for Bringing Coal from Mine or Strip Pit to Tipple or for Removing Surface Material in Strippings—Some Missabe Methods — Used for the Transferring of Supplies

ONE of the most important of the many operations in anthracite mining is the transference of large quantities of material from place to place on the surface. Both standard- and narrow-gage equipment are employed in this work. Waste rock must be removed from the breaker to the dump and often culm transferred from the pile to the breaker. At some plants it is necessary also to haul the coal to the preparation plant from distant shafts or slopes.

Where narrow-gage or small dump cars are utilized in maintaining a rock- and refuse-disposal service from the breaker each trip can handle only a small tonnage. The dead weight of such cars is unduly high as compared with the live weight and the tractive effort that the locomotive can exert is expended to little advantage. The net tonnage, consequently, suffers. The locomotive has the further disadvantage that it is too small to be really economical in operation. Moreover, such transportation is not only costly in itself but expensive also because of the large force of men which has to be maintained on the dump if, so as to charge little dead or standing time against the trip, it is arranged that the cleaning of the tracks be done by a separate crew.

In moving culm from the bank to the breaker, wherever narrow-gage equipment is utilized, similar relatively high transportation labor costs obtain. In addition to this the charge for loading and unloading is excessive because, owing to the size of the units employed, much time in both operations is consumed with little result. Where coal is conveyed to the breaker from an open pit or distant mine, the employment of narrow-gage equipment limits the size of the trip that can be efficiently handled. Furthermore, transporting coal through comparatively long distances in springless cars over rough track tends greatly to degradation of the product.

Cars of Forty-Three Cubic Yards Capacity

The accompanying illustrations show how one of the large anthracite companies is meeting its outside transportation needs with extension side-dump cars, as manufactured by the Clark Car Co., of Pittsburgh, Pa. The operation referred to now maintains a fleet of thirty of these cars and is contemplating adding from twelve to fifteen more for delivery at such time as certain extensions of its outside work are completed.

This car is of the standard-gage type and has a normal loading capacity of 43 cu.yd., or 50 tons. Each car is dumped by air supplied from the locomotive. It is not necessary to employ a special gang of men for this operation, as the cars may be emptied of their contents by the train crew alone. In dumping, the entire side of the car turns down as the body is tilted. The load thus is given a throw so that it clears the outside of the track rails by several feet. As a result it is not necessary to employ track cleaners to clear the roadways at the dumping point. With the ordinary equipment the track if not cleared would become so cumbered with material that derailments inevitably would occur. The dead weight of the car is less than that of its capacity load. This permits large tonnages to be handled per trip, with a corresponding shrinkage in the charge per ton for haulage labor.

The results obtained from the use of these cars are striking. At one operation, a train crew of two men disposes of from 1,500 to 2,000 tons of rock in an eight-hour shift. Three such crews transport and unload from 4,500 to 6,000 tons daily. The gang at the dump consists of only three men.

Culm Hauled to Breaker in Fifty-Ton Cars

At another operation culm is loaded into the cars by steam shovel for removal to the breaker. The grades on the roadway are against the loads and a single car makes up a trip. Even with this handicap the culm pile is reduced by from 600 to 800 tons daily. Two such crews suffice to keep the shovel working to capacity, with the result that from 1,200 to 1,600 tons of culm are fed to the breaker daily.

At still another operation the cars operate loaded in both directions. On the outbound trip from the breaker they carry a load of rock to the dump, and after discharging it the car is loaded to capacity with culm and returns to the breaker. This, of course, is the most effectual method of operation and should be practiced wherever possible.

Sometimes coal is transported from the shaft openings to a breaker, and the cars are loaded with rock and routed to the disposal pile on the outbound trip. By employing much longer trains than would be possible with narrow-gage rolling stock, the labor charges per ton may be reduced to an extremely low figure. In the unloading of either coal or culm at the breaker the dumping of the cars demands no labor aside from that furnished by the train crew. A simple manipulation of a control valve will serve to tilt the body of each car. After being discharged of its contents the car body is righted automatically and is locked. This action is performed by giving the air valve a turn in the opposite direction to that required for dumping. In the event that a fill is being made the dumping operation may be controlled from the locomotive, and the entire trip discharged at once. In this manner 200 tons or more may be dumped at one time.

Dumping Methods in Big Iron-Ore Pits

Far greater will be the future use of cars of this type at anthracite strippings, for all the overburden thus moved must be loaded into dump cars and transported to the dump. In the Missabe region, where large air-dump cars are used, there are no hills and almost no elevations that would make side-hill dumping possible. In the anthracite region it would in most cases be easy to excavate a side-hill road and dump the cars down the

slope. But where the foregoing would not be convenient it would be possible to build up on level ground, as in the Missabe region.

A steep grade is constructed by the erection of a light trestle such as is built in ordinary railroad construction work, and this is filled up till the desired height is reached. Where, however, there is a little roll in the ground, advantage is taken of it to extend a trestle out onto the lower ground, and dumping is commenced on each side till a fill is consolidated.

It is then easy to extend the dump either to the right or left. It is found best when a dump height of 40 ft. is reached to carry the dump in two benches or decks, for if a greater height is used the settling of the dump often causes trouble. Under average conditions a dump from 25 ft. to 40 ft. high gives the best results. The material dumped is glacial drift for most part. Under this drift in the measures is sometimes found Virginia slate.

Sometimes the track is jacked up and filled as the dump is widened out, which increases its height as well as its width. When the limiting distance horizontally is reached, it is common practice to throw the track back, raise it up and make a new level by working back over the part already filled. Another method is to build a second trestle on the first dump and to start a second deck in the same manner as the first deck.

Helping to Spread Dump by Use of Water

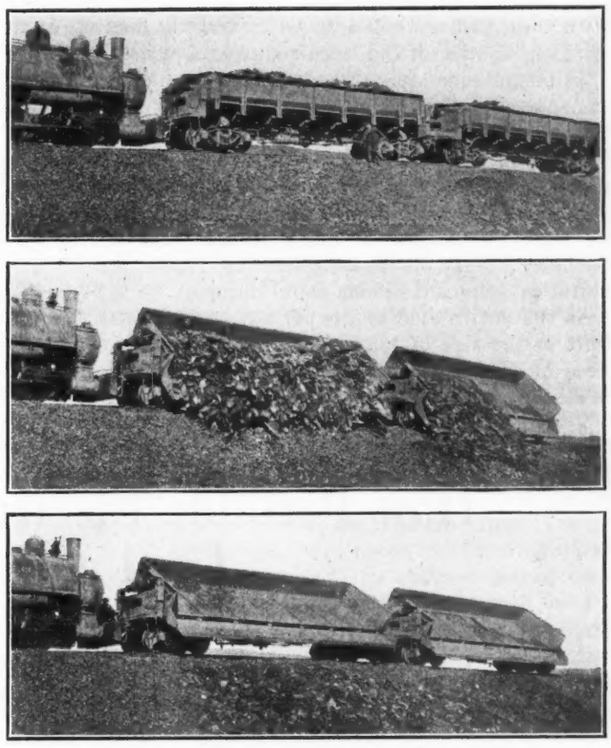
L. D. Davenport, writing in the *Engineering and Mining Journal* on this subject, says: "A slush dump may be made by the use of a trestle, substantial enough to carry the loaded train, fitted with an apron 6 to 8 ft. wide, on the dump side. A 3- to 4-in. pipe line, perforated with ¼- to ½-in. holes at short intervals, is laid along the upper edge of the apron against the ends of the ties, and water, flowing through the openings in the pipe, washes the dumped material off the apron and down the bank.

"At one dump on the shore of a lake, where the material handled was principally quicksand, a different arrangement was used: Trains were dumped until the track was filled; the accumulated material was then washed down the bank with lengths of 2-in. hose attached to a 4-in. pipe line at 100-ft. intervals. This type of dump is used for filling lakes and swamps where the necessary amount of water is easily available. Considerable stripping can be disposed of without moving the tracks, but the system is not practicable in freezing weather.

"The details of dumping operations vary with each stripping job and will depend on the equipment used, size of the job, type of dump, etc. Three methods in common use may be thus described:

Spread Dumped Material with Side Plow

"First method: A side plow or 'dozer' is used to level off the dump to the height of the track for a width of about 5 ft. The track is then jacked up, lined over three or four feet and blocked in such a manner as to carry the cars but not the locomotive. Dumping is then started at the end nearest the pit, and a shoulder is carried toward the further end of the dump, so that, as the shoulder is advanced, the track has side support and can carry the weight of the locomotive. When the limit of the dump is reached, all the material that can be dumped is placed on the end length and the remaining track is filled to the limit, working back to the beginning of the dump. The 'dozer' is then used again and the operations are repeated.



AIR-DUMP CARS OF 43-CU.YD. CAPACITY DISCHARGING

A train crew of two men can dispose of 1,500 to 2,000 tons of rock in eight hours with a dump equipment of this kind. The gang at the dump consists of only three men. The dead weight of the cars is less than their capacity load.

"Second method: A plow having a spread as wide as 30 ft. is used to level off the dump 18 in. below the track. The dump is then refilled and the spreader used until the limit of spread has been reached. The last plowing is made level with the track, which is then lined over 12 to 15 ft., and the operations can then be repeated. This method is used in connection with 20-cu.yd. cars and heavy equipment.*

Track Moved Over a Foot at Each Dump

"Third method: The track is made safe for both cars and the locomotive and the first train out is dumped. The dump crew then level off the dirt and line the track over 1 ft. or more, if possible, along that part of the dump just filled. After the track is ballasted the next train is dumped further along and the next section of track lined over as before, working toward the end of the dump. With a high dump, several trains may be emptied before a sufficient shoulder is formed to allow the track to be lined over. The crew levels the dirt and throws the track between trains. With this method there is always room to dump a train.

"With the first and second methods a dump crew consisting of a foreman and one or two men is required on each dump and both shifts. A track crew also is required, consisting of a foreman and fourteen men working day shift only. Under ordinary conditions a crew of this size can handle the track work on four dumps.

*Today 30-cu.yd. cars are quite common in this class of work. It will be noted that the cars described as being used at one anthracite operation are almost 50 per cent larger. Probably when the anthracite plants break away from their old equipment and their present method of contracting they will distance even the iron regions in the size of their equipment and their large methods of operation.—Editor.

With the third method a foreman and six men on each shift can handle all the work required for one dump."

At bituminous strippings, where the product must be transported from the pit to a preparator building for cleaning and sizing, the same economies may be effected by the use of these cars as are realized at anthracite mines. The loaded carriers are dumped into a hopper at the foot of the building. The coal is then delivered to the tipple by means of some suitable conveyor. No ratchets and pawls are present to freeze up in the winter months and hinder rapid dumping.

As the entire side of the car turns down, there is no limit to the size of lumps that may be loaded, for any piece of material that can be placed upon the car can be discharged. Stripping is primarily an earth-moving operation. This probably is the reason why such wide use has heretofore been made around strip pits of the types of rolling stock employed by contractors, despite the fact that side-dump cars operating on narrow-gage track are poorly designed for the work of moving coal.

The standard-gage side-dump car has a low center of gravity and can negotiate curves of short radius without danger of overturning, as well as travel over temporary and poorly-laid track. Such cars also may be advantageously employed in moving supplies about the mine. The side may be lowered when such a car is placed alongside a loading platform and materials taken aboard without resorting to the use of any variety of hoisting equipment. This will be advantageous when moving lumber, machinery and the like.

How Portable Electric Drills May Best Be Used and Cared For

Capacity Rated on Ability to Drill Mild Steel—Direct or Low-Frequency Alternating Current Preferable—Drill Will Not Stall Except if Bent or Upon Passing Through Plate—Care of Armatures, Fields, Gears and Cables

By E. L. Connell*
Cleveland, Ohio

THE portable electric drill embodies essentially an electric motor and should be given all the care and consideration usually accorded to such a machine. The small sizes of drill in common use are equipped with a universal motor which drives the chuck through a train of gears that give a drill speed between one-fifth and one-twenty-fifth of that of the armature. Energy is supplied to the tool through a flexible cable with a lamp-socket connection and is controlled by a switch conveniently located on the handle of the drill. A typical tool of medium size is illustrated on page 820. It weighs 10½ lb. and is capable of drilling ⅞-in. holes as fast as the operator can force it through the work.

Portable electric drills have rapidly shown their value in the machine, electric and car shops of the coal mines, where the high cost of day labor makes it highly profitable to furnish such mechanical assistance as will save time and labor. Car repairs are an important item of expense at any mine. With a power drill these costs can be greatly reduced, cars can soon be returned to operation and in some cases employment of an additional man can be avoided.

A drill of ¼-in. capacity and one of ½-in. capacity are shown on pages 821 and 819, respectively. The capacity of electric drills is based on the power and speed requirements of a carbon-steel drill boring a hole through 0.20 to 0.30 per cent carbon steel. It is evident that the capacity of such a tool will vary with the material upon which it is working, also that the speed for maximum production will change with conditions, but by standardizing on some one method of rating, such as that mentioned, the manufacturers have done much to aid the prospective purchaser by giving him a basis of comparison so that he can select the tool most nearly meeting his requirements. By the exercise of judgment acquired through experience the maker can readily recommend the proper tool for special applications such as wood boring, though the capacity may vary widely from its rating in steel owing to the nature of the material, the depth of the hole, and other variables.

The speed appearing on the name plate is the free-running speed and bears no definite ratio to that attained under load. This may decrease the number of revolutions 25 to 50 per cent or even more. It is not generally appreciated that this characteristic automatically adjusts the speed of the tool to correspond with the size of drill being used and the hardness of the material. An operator who has become acquainted with the tool will have little use for a two-speed machine with gear-shifting mechanism. The greater simplicity and ruggedness of the single-speed tool would even justify some sacrifice if a compromise were necessary.

Feed pressure is the important factor in obtaining the best performance from an electric drill. The pressure required for drilling in steel to the full capacity of the tool is greater than can be exerted by hand for all except the smallest sizes. Even in these tools as built by the best makers enough power is available to operate the drill under all the pressure a heavy man can exert. A pressure of 500 lb. is seldom too much for a ½-in. machine drilling in steel. A feed screw, therefore, usually is supplied with the larger sized electric drills.

*Chief engineer, The Van Dorn Electric Tool Co.

The minimum boring performances of a universal drill with carbon-steel bits in 0.20 to 0.30 carbon steel should be as indicated in the following table. The operating speed represents a cutting speed of 50 ft. per min.

MINIMUM DRILLING PERFORMANCE OF UNIVERSAL PORTABLE ELECTRIC DRILLS

Carbon-steel bits drilling in 0.20 to 0.30 carbon steel

Size of Drill, Inches	Speed, R.p.m.	Rate of Feed, Inches per Min.	Power Consumption at 1 Hp. per Cu.In. of Metal Removed per Min.
¼	800	1½	0.08
5/16	650	1⅜	0.10
⅜	525	1¼	0.13
½	375	1	0.19
⅝	300	¾	0.23

* Extensive tests have shown this to be a reliable basis for determining power requirements.

The free-running speed will be about twice that given in the above table except where the tool is designed for a lower cutting speed. The capacity of the motor should appear on the name plate in amperes, and the motor should be capable of carrying this load for thirty minutes without overheating. As far as the motor is concerned the temperature reached in this time may be 50 deg. C. (90 deg. F.) above the room temperature.

Despite Speed, Forced Draft Cools Coils

High armature speed gives an excellent opportunity to make use of forced ventilation, and with a well-designed fan the cooling system is highly efficient. The nature of the work is such that full capacity of the motor is never required continuously for thirty minutes. Consequently if the tool will stand this test, no objectionable heating will result in actual practice.

The ampere capacity of these tools is not always given, in which case a test by competent engineers is the only method of checking their power and heating characteristics. The efficiency at a load which reduces the speed to about the figure given in the table above will vary between 40 and 60 per cent, according to size and design. An approximate check may be made on this basis.

In checking the performance of a universal motor the test always should be made on 60-cycle alternating current. The characteristics of a motor of this type are similar to those of a direct-current series machine, but the construction is changed to permit operation on alternating current. These structural differences include lamination of the magnetic circuit of the field—often a slotted field design with the windings distributed in slots—a high ratio of armature to field turns, and a large displacement of the brushes from neutral position.

These special features are all used to reduce the reaction of the windings and maintain the power on alternating current. The power developed with alternating current will always be less than that obtained with the same direct-current input.

Low-Frequency Is To Be Preferred

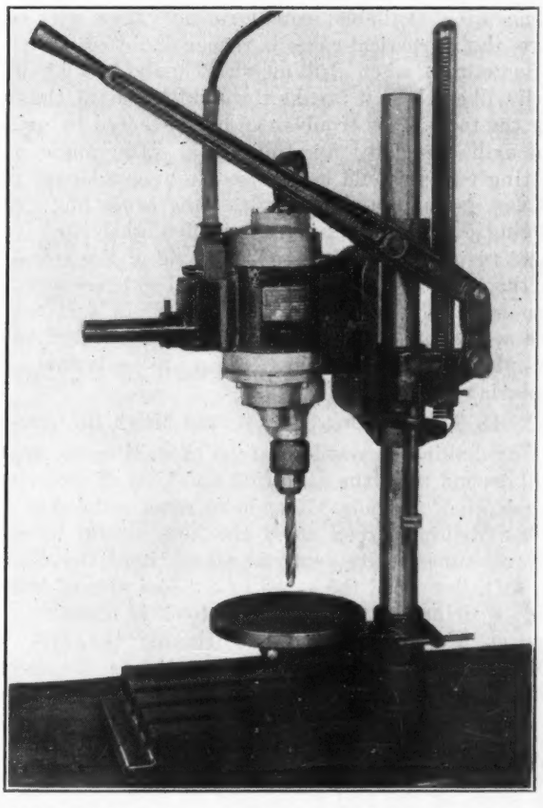
Manufacturers of this type of motor usually do not recommend them for use on frequencies higher than 60 cycles because the efficiency falls rapidly with increasing frequency. The lower the frequency the more nearly do the characteristics on alternating and direct current coincide. It will be found that when the tool is operated on high-frequency circuits the power will be deficient and the heating excessive.

Brushes furnished for the motors of portable drills have been chosen as the result of exhaustive tests made by the maker who is seeking to obtain those that will give the best performance and have the longest life. It is therefore imperative that only such brushes be used as are furnished by the manufacturer for the particular machine. A brush made from any material at hand may ruin the motor. Some of the effects likely to occur from substituting unsuitable brushes are overheating from friction, sparking or high resistance.

If the material is too hard the friction and wear on the commutator are excessive, and if it is too soft the mica may wear high and bring on chattering and destructive sparking. If the resistance of the brush is too low, excessive short-circuit current will cause sparking and overheating of the commutator and armature coils; and if the resistance is too high the normal current may overheat the brush. The life of the brushes cannot be stated in ordinary terms because of the great variation in the use of the tool. However, it is wise to examine the brushes before the expiration of 200 hours of actual running. It also will be a help to clean the commutator with fine sandpaper several times during the life of the brush. The tension on the brushes should be uniform and just sufficient to prevent arcing on a smooth commutator. A tension of at least 4 lb. per square inch of brush contact usually is necessary. Should the commutator become rough the armature should be removed and the commutator refinished by taking a light cut in a lathe.

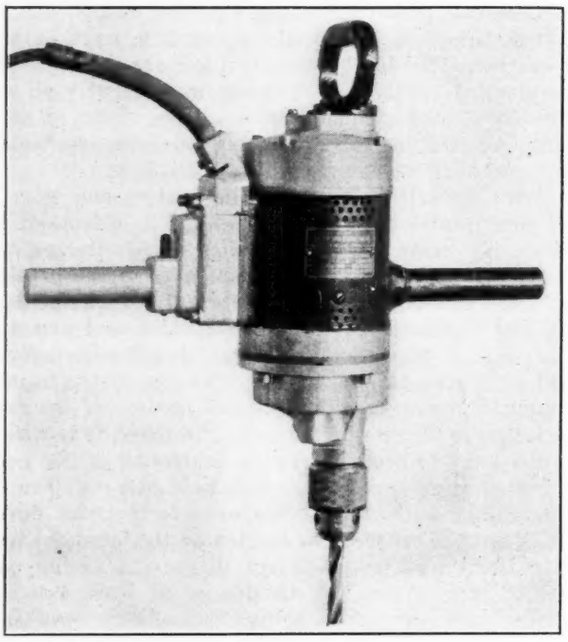
Well-Built Tool Should Never Stall

All well-built tools of this type have enough power to absolutely prevent stalling except under accidental circumstances. When this occurs through the bending of a drill or other mishap the power should be cut off as soon as possible. Momentary stalling of this kind will



PORTABLE MACHINE MOUNTED ON DRILL PRESS

In the drilling of steel with a ½-in. machine the motor nearly always will run without stalling so long as the pressure on the drill is kept at or below 500 lb.



PORTABLE DRILL WITH TWO ROD HANDLES

A grip handle also is provided at the rear of the drill. The tool when drilling in green wood should be cleaned frequently if the hole is to be driven to a depth many times greater than the diameter.

not injure a well-designed machine. The part most liable to failure under such circumstance is the switch, which must then act as a circuit breaker. Quick break and a generous contact area are highly important requirements. Some tools are equipped with fuses for such emergencies, but as the operator, not finding a fuse immediately available, usually replaces them with copper wire, their practical value is rather doubtful.

Sometimes when drilling sheet metal the lip of the drill will catch as it breaks through the metal, thus stalling the tool. This trouble can be prevented by grinding the drill especially for this work. The angle of the cutting edges should be reduced to give a longer point; 59 deg. is the standard angle. The acute angle of the cutting edge should be ground off slightly to give the same result as would a smaller angle of the spiral flute to the axis of the drill. This latter procedure alone also may help to prevent "grabbing" in soft material and will allow of high feed pressures without causing chipping of the cutting edges in extremely hard material.

In Thick Wood Ship Auger Must Be Used

For drilling in wood the type of drill to be employed will depend upon the condition and kind of material and the depth of the hole. Deep holes require the ship auger. When drilling green wood the hole should be cleared several times if its depth is many times the diameter. In soft, dry wood the speed of cut and size of hole that can be drilled with these little tools is amazing. This matter of choosing and conditioning the drill is an important one and can best be solved by the mechanic on the job.

The better class of tools are lubricated with grease which gives maximum cleanliness with minimum attention. It is good practice to replenish the grease supply as often as the tool is cleaned or inspected. This, on account of brush wear, should not be less than once in each 200 hours of service.

All reliable machines have ball-bearing armatures, which will operate without load at from 10,000 to 18,000 r.p.m. With a poor bearing this would result in destructive vibration. On the slow-speed members, such as the compound gear shaft and chuck spindle, plain bronze bearings of ample size have given satisfactory service but a tendency exists toward the use of ball bearings on these members as well. The danger here encountered is that of overloading through lack of room wherein to install a bearing of sufficient capacity. The thrust is an important item, and must be taken up by a ball bearing of the direct thrust type or one of the angular contact type capable of carrying both longitudinal and radial loads.

Inspect Your Armature Frequently

The armature is the most delicate part of any machine of this type and it is the first member to be examined should the machine show signs of distress. In many intances a motor may be completely burned out because signs of trouble are neglected. If severe sparking appears at the armature the tool should be taken out of service at once and sent to a competent electrician for inspection.

These machines, of course, are subject to the ordinary diseases of electric motors, and these may be detected in the usual way. If grounds have developed they may be discovered with the aid of the magneto ringer. If they cannot be detected in the armature, the field, switch and cable connections should be tested. An open circuit in the armature will be shown by burning between the commutator bars to which the open coil is connected. A "short" within a coil will burn out the shorted turns. If there is a "short" between commutator bars it will overheat the bars thus shorted.

A "short" between bars may sometimes be repaired, if discovered before the coil is burned, by removing the foreign substance causing it, but an open or shorted coil requires a rewind. If the armature is built with open slots and form-wound coils, the repair in many instances can be made economically by the average repair man provided he purchases the coils from the maker. If the armature is built with semi-closed slots it probably will be wise to return it to the maker for rewind. The maker's guarantee of correct rewinding should not be overlooked, hence it is strongly recommended that the maker be asked to make all difficult repairs or those more or less out of the ordinary.

Fields and Gears Rarely Give Trouble

The fields are not apt to give trouble, but occasionally they are burned out by operating the tool after the armature has failed. A shorted coil will cause overspeed or flashing when the switch is closed. Rewinding the field coils is simple, but the coil must be kept within the original dimensions and must be properly fastened into position. The best tools have windings treated with an impregnating varnish by an elaborate process. This furnishes an excellent reason why a rewind by the maker is preferable to one made locally. This is perhaps more important in the repair of the armature than in that of the field.

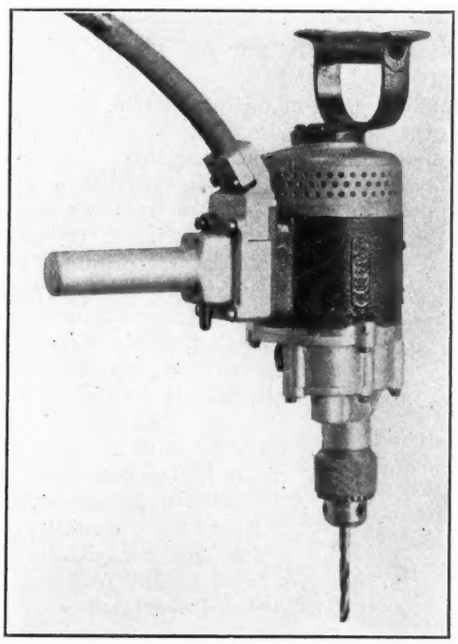
The gearing on the better class of these machines seldom gives trouble. These parts, however, are subject to wear and should be made so as to be renewable with a minimum of trouble and expense. A removable armature pinion is a highly valuable detail, as it permits renewal of this part without the cost of a new shaft and a rewind, which are required when the pinion is made

integral with the shaft. This objection becomes still more forcible where the commutator is built directly upon the shaft.

Cable Should Be Suspended and Balanced

The cable connection often is abused. It is sometimes used to drag the tool around, and trucks are run over it. Some types of cable are better than others but all require reasonable consideration, and, where the drill is used in one position only, as on production work, both it and the cable should be suspended from above and counterweighted. The machine is then always accessible and the cable is not abused. Some tools are provided with terminal screws, by which a new cable can be attached without the aid of a soldering iron.

The weight of a portable electric drill is an important consideration, but the lightest type of tool may prove



LIGHTER DRILL WITH ROD AND GRIP HANDLE

Cable is shown going upward at a good angle. A suspended cable will have a longer life and give better service than one which is allowed to drag along the ground.

difficult to maintain. Weight is reduced by increasing the armature speed, by the use of aluminum housings and by employing the best steels properly treated. An excessive armature speed will shorten the life of the tool, and the only assurance of proper design and material in the gear train is the reputation of the maker. It also should be borne in mind that the aluminum housings may be crushed by pounding or by dropping the tool. Caution of this kind may be unnecessary, but it is appalling how much abuse of this sort some tools receive.

Portable electric drills as manufactured by the leaders in this industry should not be classed with vacuum cleaners and other domestic appliances. They are built to machine-tool accuracy, of the finest materials, distributed in a manner that gives the purchaser much more for his money than is possible in the domestic appliances mentioned. They are built by mechanics for the use of mechanics; they are practical, rugged machines that will save many hours in miscellaneous drilling operations and are indispensable in production where the drill must be taken to the work.

How to Install a Tipple Scale So That It Will Not Fail to Give Correct Weight

By E. C. Dodge
Denver, Col.

Ever since the inauguration of the custom of placing scales on the tipple so as to obtain the weight of the coal as it came from the mine, weighing has made more or less trouble both for the miner and the operator. The causes leading to discrepancies in weight are various and are often quite difficult of detection. Consequently I will enumerate only a few of the major reasons as I have found them.

When tipple scales were first installed back in the nineties, most of them were set up hurriedly and almost any kind of construction was resorted to in order to get the scale in place as soon as possible without delaying production. In many instances these scales were installed at night or on Sundays or holidays.

As the designer of the tipple had made no provision for the installation of scales, sometimes it was quite a problem to place them at a point convenient to the shaft without making serious changes in the timber work. In most cases such alterations were left to the scale men. Under the circumstances many scales were not properly installed, and it was only a short time until they began to give trouble. Being placed on the same framework as that which supported the shaker screens, they naturally were subject to more or less vibration, which as the timbers became older and softer grew worse and worse, to the detriment of the original accuracy of the weighing device.

In many instances even today the scale is mounted upon the same timbers that support the shaker screens. In nearly every case of this kind trouble develops with the weighing apparatus. Vibration causes the bearings of the scale to shift, and the weights indicated will vary in consequence. It also has a tendency to loosen bolts. When these are slack the levers are likely to settle out of level and this causes undue friction on the knife edges, thus introducing another cause for variations in weighing.

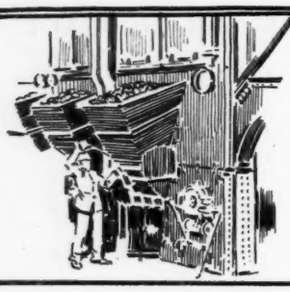
Most of these troubles can be overcome by installing the scale on a foundation entirely independent of the tipple structure. Sometimes this precaution may appear to be an extra expense but it is easy to perceive the benefits that may be derived by having correct weights all the time, with everybody satisfied.

The time to install a tipple scale is when the tipple is being built. The designer can then plan the supports for the scale so that they will not be interfered with in any way by the shaker-screen construction.

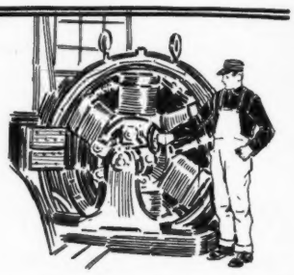
Cost of American, European and Asiatic Labor Compared

Information showing the comparative labor cost in America and in foreign countries was laid before the Ways and Means Committee of the House in the recent hearings on the Fordney emergency tariff bill, which was vetoed. The figures were presented by the representative of a prominent American industry, who has investigated labor costs at home and abroad, and he finds the following average costs of labor per hour (in every case the reckoning is in terms of gold and the comparison is between comparable production groups):

United States	70c. per hour	Great Britain	18c. per hour
France	15c. per hour	Germany	6c. per hour
Japan	4c. @ 5c. per hour		



Power Equipment



Seven Recent Changes in the Stirling Boiler

Front and Rear Steam Drums Raised, the Latter Being Protected by a Baffle—Steam Now Taken from Rear Drum—Superheater Chamber Enlarged—Bonding Tile Used in Front Wall—Present Standardization Has Reduced Number of Types from Fourteen to Three

DURING the last fifteen years many changes have been made in the Stirling boiler. Some of these have been intended to meet special and unusual operating conditions, while others have been improvements in some detail of design and construction. The principal improvements in design over the boiler hitherto offered are as follows:

(1) All steam drums are now placed on the same level, the steam being taken from the rear steam drum.

All tubes between the drums through which steam and water circulate are distributed on the basis of the experience gained in numerous tests made under service conditions, the necessary degree of restriction to the flow of steam and water which they give being such that water in which the impurities have become highly concentrated can be handled without difficulty from priming. The time in which impurities in the water will become objectionably concentrated depends on the rate at which steam is made, and in the old form of boiler some feed water that at low capacity could be readily handled would begin to prime in a troublesome degree unless an unusual and wasteful quantity of water was blown off.

Many experiments were made to overcome priming troubles under the peculiar conditions sometimes encountered, with the result that in the Stirling boiler, as now designed, the steam is taken from the rear drum, which is raised to the level of the center steam drum. This construction enables the redesigned boiler to carry a concentration of salts that, with a steam outlet in the center drum, would undoubtedly lead, in certain instances, to priming. The change has been made not with any idea of advocating higher degrees of concentration than are now usual but in order to meet conditions under which the impurities that are carried by the feed rapidly become concentrated.

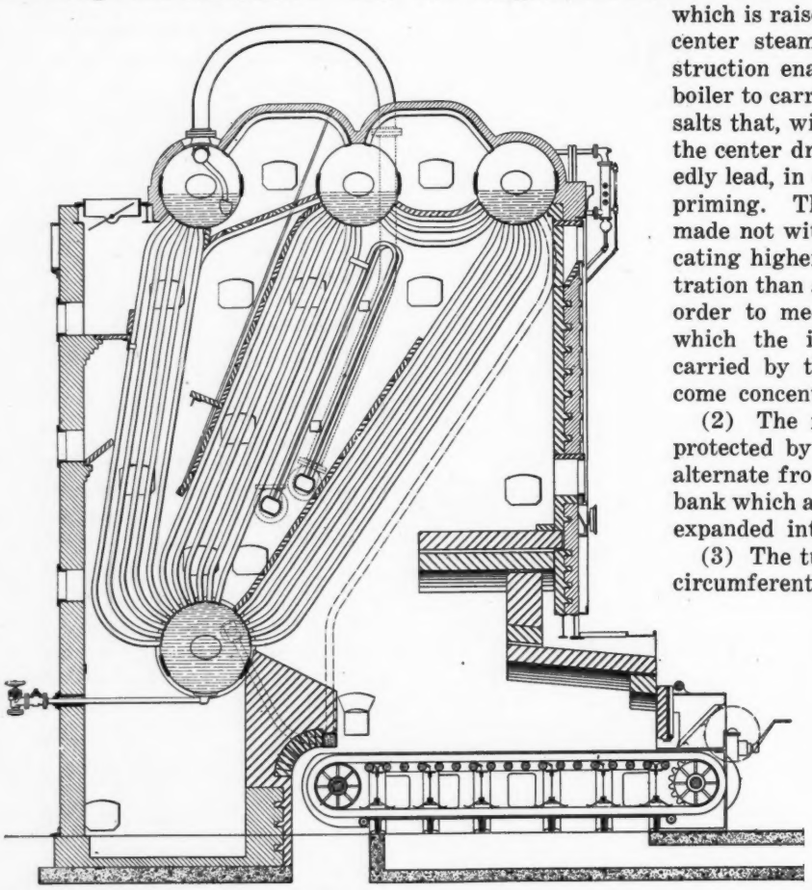


FIG. 1. SECTION THROUGH ONE OF THE NEW TYPES OF STIRLING BOILER

Note that the steam drums are level, that steam comes from rear drum and that the front and center banks of tubes are separated by a large space on the periphery of the mud drum. Note also the construction of the front wall.

(2) The rear steam drum is protected by a baffle carried on alternate front tubes of the rear bank which are bent forward and expanded into the center drum.

(3) The tubes are so arranged circumferentially on the mud drum that they give a larger superheater chamber. In the earlier design all tubes were pitched at equal intervals around the mud drum, there being no extra space between the rear tube of the front bank and the front tube of the middle bank. This caused the superheater chamber to be excessively cramped at the lower end, making it difficult and uncomfortable to get at the headers of the superheater.

In the redesigned boiler a space is left between the front and middle banks equal to that hitherto occu-

pied by two tubes. This provides for a greater amount of superheating surface and for higher superheat than was previously obtained, simultaneously making it much easier to get at the superheater headers and handhole caps.

(4) In stoker-fired work, except where the stokers are of a design that permits of their carrying the front boiler wall, this wall is carried on supporting members

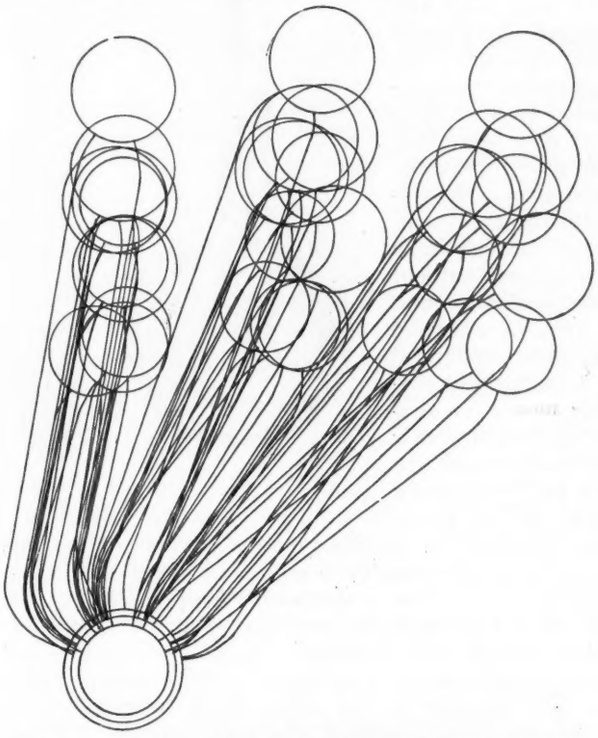


FIG. 2. ROUGH OUTLINE OF THE FOURTEEN OLDER CLASSES OF BOILER

One company at least has taken to heart the lesson that a multiplicity of standards makes for high cost of construction and slow delivery. Fortunately it does not have a track gage and existing equipment to match it (to which new equipment must be fitted) to interfere with efforts at standardization.

furnished as part of the standard boiler equipment. Where this front wall is so carried, a slip joint is used between the front boiler wall and that portion of the wall that is carried on the stoker. These features not only definitely fix the responsibility for the carrying of the front boiler wall but give a construction that may be repaired without taking down the entire front of the setting.

(5) Where the size of the boiler wall is such as to make it advisable, bonding tile with properly designed supporting members is regularly employed. This construction, as proved in operation, successfully overcomes the tendency of the front wall to spring inward. Where necessary it is followed in the side walls also.

(6) In the earlier designs, where battery settings were installed, a three-legged center support was standard in the division wall. In the redesigned boiler the center support has only two vertical members, doing away with the objection sometimes raised to the third or incased leg.

(7) In battery settings special means of access for inspection of the inside mud-drum heads is standard in the redesigned boiler.

The studies preliminary to the redesigning of the Stirling boiler naturally led to a consideration of the differences between classes and sizes of boilers. This has resulted in an entirely new classification in which the variation between the classes and sizes is simple, logical and progressive. The gradations between classes is clearly indicated by Fig. 3. Compare this with the classes hitherto used, as shown in Fig. 2.

While the purchaser of steam boilers is not primarily interested in methods of manufacture, provided proper

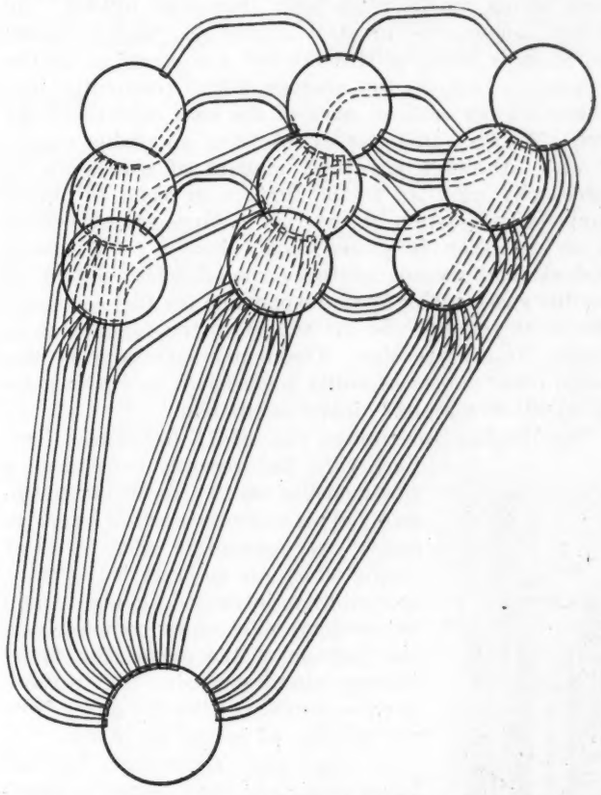


FIG. 3. SOMEWHAT FULLER OUTLINE OF PRESENT CLASSES OF BOILER

Three classes have replaced fourteen. Note that the larger boiler has three water tubes between the front and the middle steam drums and the two smaller sizes have only two. In all boilers alternate front tubes of the rear bank are expanded into the middle steam drum.

construction is followed, it is, however, the purchaser who ultimately receives the benefit of any improvement in manufacturing methods. The reclassification undoubtedly will lead to reduction in manufacturing cost. Comparison between classes as hitherto standard and as now reclassified leaves no question as to which leads in simplicity of manufacture.

With reclassification the manufacturing costs will be reduced as the quantity of material that must be carried will be lowered; fewer standards will be in use, more of the parts will be interchangeable and the manufacturer will be able to build more nearly for stock. This will make the output more flexible and result in prompter shipments.

While the manufacturers of this boiler will offer previous standards to complete plants in which such standards were installed, it is the intention in all new work to offer the redesigned and reclassified boilers. A side view of one of the new classes of Stirling boilers with superheater and chain-grate stoker, is shown in Fig. 1.

FEBRUARY EXPORTS through the Port of New York were 5,133 tons of anthracite, 8,037 tons of bituminous, and 809 tons of coke. In the corresponding month of 1920 exports were, 2,933 tons of anthracite, 2,858 tons of bituminous, and 1,926 tons of coke.

Recorder Indicates in Boiler Room and Office What Excess of Air Is Admitted to Fire

HIGH production costs are causing coal operators and other power-plant owners to utilize all available means of reducing heat wastes. Perhaps coal-mine plants waste more heat than any others. As is well known, the greatest single heat loss in boiler operation is incurred through hot gas escaping up the chimney. This, in the average plant, frequently represents 35 per cent or more of the heat content of the coal. Much of this loss arises from an undue supply of air. Although a certain amount of excess air is necessarily admitted to the furnace in order to obtain complete combustion of the fuel, a large excess results in a loss that is unnecessarily heavy. Continuous analysis and records of the carbon-dioxide content of the flue gases enable those responsible for fuel consumption so to regulate the air supply to the furnace as to obtain the best results. Frequently such records also reveal other causes of boiler inefficiency, so that wasteful practices may be "nipped in the bud."

The Uehling Instrument Co., of 71 Broadway, New York City, has recently introduced a new model of its CO_2 recording equipment. This embodies certain improvements over preceding models, chief among which are quick action, greater accessibility, increased simplicity and the economy effected by combining in one instrument the means for determining simultaneously the carbon-dioxide contents of the flue gases from any number of boilers up to six.

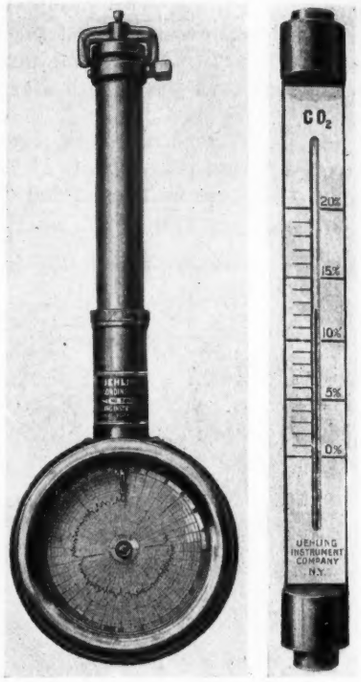
FIG. 1

A single-unit equipment for one boiler consists of three elements, namely, the CO_2 meter proper (Fig. 1), the recorder (Fig. 2), and a boiler front indicator (Fig. 3). The meter may be placed at any convenient point. Its function is to actuate the indicator on the boiler front and to operate the recorder which usually is placed in the engineer's office.

The flue gas is analyzed in the meter in a manner that can be understood by reference to Fig. 4. Flue gas is caused by means of an aspirator to flow continuously, at first through the aperture *A* and then through the aperture *B*. The volume of gas is reduced between the two apertures by the absorption of the carbon dioxide in the gas, and this causes the pressure existing in chamber *C* to be lower than that which the aspirator would normally cause. This pressure is transmitted to the recorder and indicator which are calibrated to register the decrease in pressure in terms of the carbon-dioxide content of the flue gas.

The meter consists essentially of a cylindrical regulator on which is mounted the analyzing mechanism. This regulator maintains constant the suction created by the aspirator, thereby eliminating all changes in pressure between apertures *A* and *B* except that arising from the absorption of carbon dioxide. This change is registered by the indicator and recorder.

Suction created in chamber *C* actuates the recorder and indicator instantaneously and continuously. In the new model the travel of the gas from the boiler to the analyzing chamber is hastened by utilizing the exhaust from the main aspirator in an auxiliary aspirator for drawing the gas from the boiler up to the analyzing instrument. The main aspirator then draws the gas sample through the absorption chamber. The soot and dust are removed by a preliminary filter before the flue gas reaches the apparatus. This filter may be conveniently cleaned in a few seconds without interrupting operations. Multiple equipments combined in a single outfit provide means for analyzing, independently and continuously, the flue gas from two or more boilers up to and including six. As these meters are built on the unit or sectional plan, additions may be made to them from time to time. Thus a single-unit outfit might be purchased in the beginning and additional units added as other boilers are installed. With the multiple-unit machine each boiler is equipped with its own recorder, its own indicator on the boiler front, its own preliminary filter and absorbent chamber, together with all necessary appurtenances. The aspirator and other parts of the master unit serve all boilers in common.



FIGS. 2 AND 3

The recorder makes a continuous record of the carbon-dioxide content of the flue gas, furnishing what might be termed an "autographic history" of the operation of each boiler throughout an entire day. This indicates when the fires receive attention, when and for how long the furnace doors are open, how often the stoker feed or thickness of fuel bed are changed, when the fires are broken or cleaned, the effects of damper regulation and of methods of firing.

The boiler-front indicator enables the fireman to know whether he is supplying the amount of air which will consume the fuel with the least possible loss of heat in the chimney gases. Chemical solutions are not employed, their place being taken by a dry absorbent carton readily removed and replaced.

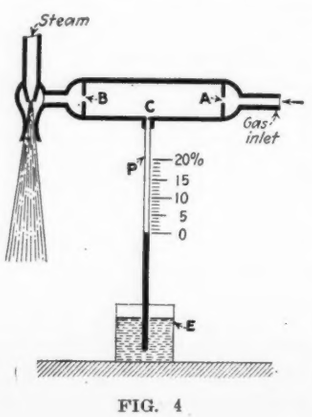
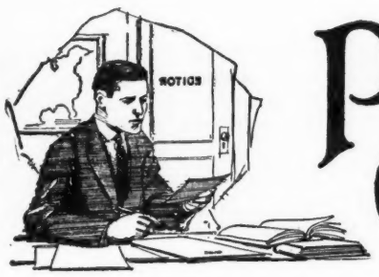


FIG. 4

These CO_2 recorders are designed primarily for service in the boiler room rather than for use in the laboratory. Accordingly all parts are made readily accessible. The apparatus may be combined with Uehling pyrometers to give upon the same chart continuous records of both the carbon-dioxide content and the temperature of the stack.



Problems of Operating Men

Edited by James T. Beard

Shelter Holes on Haulage Roads

Drawing Attention to Inadequacy of Many Mine Laws Providing for the Use of Roomnecks as Shelter Holes. Used as Shelter Holes, They Are a Menace to Safety

IN A LONG experience as mine official in the bituminous region of Pennsylvania, it has been my good fortune to often hear discussed that section of our mining law which permits the use of roomnecks as shelter holes on haulage roads. The conclusion has generally been that this provision of the law is wholly inadequate for safety.

The Bituminous Mine Law of Pennsylvania, Art. 4, Sec. 8, reads:

> The mine foreman shall see that, on all animal and mechanical hauling roads, holes for shelter shall be cut into the strata not less than 2½ ft. deep and 4 ft. wide and level with the road, at least every 30 yd., and kept whitewashed and clear of obstruction; except in entries from which rooms are driven at regular intervals not exceeding 90 ft.; provided that the entrance to each room be kept clear of obstruction for a distance of 3 ft.
>
> On all main haulage roads on which hauling is done by machinery, shelter holes shall be cut into the strata not less than 2½ ft. deep and at least 4 ft. wide and level with the road and not more than 15 yd. apart; and said shelter holes shall be kept whitewashed and clear of obstruction; except in entries from which rooms are opened at regular intervals not exceeding 45 ft.; provided that the entrance to such rooms be kept clear of obstruction for a distance of 3 ft.

To my mind, it is not a safe proceeding to consider a roomneck as a shelter hole. There are several reasons why the use of roomnecks for this purpose is not safe. While rooms are being driven there is no certainty that the mouth of the room will be free from obstruction. A loaded car may be standing there just at the time when the space is most needed for protection.

Roomnecks Used as Refuge Holes Expose Miners to Danger

For the sake of illustration, let us suppose there are a number of rooms working on a main haulage road and a miner has forgotten to change the latches leading to his room. Another miner coming down the entry hears an approaching trip and steps into this roomneck believing he is safe while the trip is passing.

The motor is pushing a few cars into this entry and the motorman knows nothing of the latches being set for the room. As a consequence, the trip of cars is pushed into the roomneck and the man waiting there is either injured or killed.

Again, suppose when a man has stepped into a roomneck to allow a trip to pass him safely and is caught by a car that has, at that moment, gotten away from the miner working at the head of the room. This is not an unheard of occurrence.

Such Accidents Not Uncommonly Happen in Our Mines

Instances such as these have come under my personal observation, at different times, and they convince me that roomnecks are not safe places to be used as shelter holes on haulways. But, the way the law reads it is unnecessary to provide other places of refuge on roads where the rooms are driven at regular distances apart, not exceeding the distance named in the law for refuge holes.

In my opinion, where rooms are turned off haulage roads there should always be provided shelter holes cut in the rib between adjoining rooms. On roads where mechanical haulage is used, the distance between these holes should not exceed 45 ft.; and on roads where animal power is employed, the distance should not exceed 90 ft. To comply with the law, these holes should be on the clearance side of the entry, opposite to the trolley wire.

Pittsburgh, Pa. JOSEPH NORTHOVER.

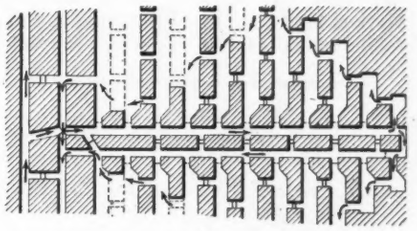
Operator Owns Coal Rights Only

Damage to surface avoided, in the room-and-pillar system of mining, by only taking out each alternate pillar in the rooms.

PERMIT me to suggest what I believe is the best and cheapest way of gaining the largest extraction of coal with the least possible chance of damaging the surface. I am referring to the inquiry of Mining Engineer, *Coal Age*, Feb. 24, p. 369, regarding the working of a 300-acre tract, in the Pittburgh seam lying at a depth ranging from 250 to 300 ft. below the surface. In this instance, the operator owns the coal rights only.

The plan I would adopt, in this case, is the room-and-pillar system of mining. The rooms should be driven on 40-ft. centers and widened out to a width of 20 ft., making the room pillars 20 ft. wide. As shown in the accompanying figure, I would use the advancing method, drawing back the pillars as each room reached the limit.

In order to incur no risks of damage to the surface, I would drive the rooms in pairs, taking out the pillar between the two rooms of each pair, but not removing the pillars between the several pairs of rooms. I have indicated



DRAWING ALTERNATE PILLARS PREVENTS SURFACE DAMAGE

this by the dotted lines in the figure, which show where the pillars are removed.

All rooms should be driven on sights to insure the full thickness of each pillar, and breakthroughs should be made 6 ft. wide. The rooms must be well timbered, using good cap-pieces, or light crossbars over the props for the better support of the roof.

In this system, the conditions being favorable, machines can be used both in driving the rooms and when drawing back the pillars. In taking out the pillars, I would make a cut 6 yd. wide through the pillar, leaving a stump 2 yd. thick on each side of the cut.

When the first cut has been made through a pillar, good cribs should be built in each room at points that will offer good support to the roof. By continuing this plan, most of the coal in each pillar can be removed back to the entry stumps. All timbers, cribs and coal stumps should be left for the support of the roof, in order not to damage the surface. T. K.

Echo, Pa.

ANOTHER LETTER

Working a 300-acre coal tract by adapting the plan of extraction to the increasing depth of cover.

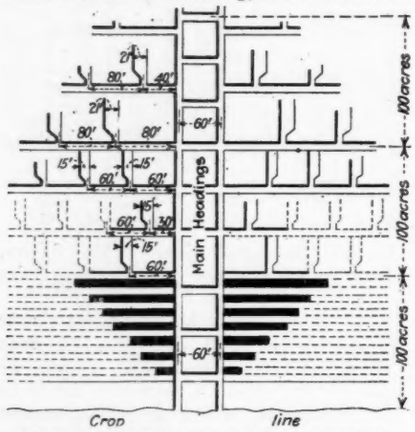
THE inquiry that appeared in *Coal Age*, Feb. 24, p. 369, regarding the working of 300 acres of Pittsburgh coal, describes the proposition as having a cover ranging from zero at the outcrop to 300 ft., in depth, under the hill. The approximate acreage is also given for varying depths of cover.

The statement is made that the operator owns the coal rights only, and he is therefore anxious to avoid any damage being done to the surface in the extraction of the coal. It appears to me that it would be well, in this case, to adapt the plan of working to the increasing depth of cover.

With this idea in mind, I have prepared the accompanying sketch showing the entire tract as being divided into three sections of 100 acres each. This, of course, is only roughly approximate, as the distribution of the acreage is not given. The main entries are driven in from the outcrop, on 60-ft. centers.

ADAPTING THE PLAN OF WORKING TO INCREASING DEPTH OF COVER

As I have indicated in the figure, starting from the outcrop, the coal in the first one hundred acres can be worked best, perhaps, by the pillar-and-stall method of mining, which consists



PROPOSED PLAN OF EXTRACTION

in driving narrow stalls 10 or 12 ft. in width, on 20- or 25-ft. centers, and drawing back the pillar as each stall reaches the limit.

Again, in the second section of one hundred acres, I would drive cross-headings to the right and left of the main entries at distances of, say 50 or 60-yd. apart. In this section, rooms are turned off the cross-headings on 60-ft. centers and driven up 5 yd. in width, to the chain pillar.

In the third section or the remaining one hundred acres, cross-headings are driven to the right and left of the main entries, as before, say at distances of 75 to 80 yd. apart. In this section, the rooms are turned off the cross-headings on 80-ft. centers and driven up 7 yd. in width. In each of the two sections last named, the rooms are driven staggered as shown in the figure.

This plan will leave the remaining coal in good shape and will not disturb the two seams overlying the Pittsburgh coal, which can be taken out at the proper time, later. Also, there will be no damage done to the surface. In my opinion, the adoption of some such plan as this will make it possible to extract from 65 to 75 per cent of the coal and leave the balance in good shape for future operations.

———, Pa. OPERATOR.

Wise Superintendence

Wisdom and tact essential to superintending a mine successfully, particularly where the superintendent's knowledge of underground conditions is limited.

THERE is no doubt in my mind but that the success of a superintendent depends largely on his wisdom in dealing with matters and men in his charge. The superintendent of a mine may be wholly capable in respect to the arrangement and operation of all surface equipment and yet his actual experience underground be limited.

In such event the superintendent will need to use much judgment and tact in dealing with inside affairs. Everything will depend on the confidence he is able to place in his mine foreman. That man should be a practical miner, having a thorough knowledge of what is required in the mine and capable of handling his men and directing the work in his immediate charge.

A WISE SUPERINTENDENT CAN LEARN MUCH FROM HIS FOREMAN

If the superintendent is wise he will listen carefully to any advice and suggestions offered by his foreman in regard to the more successful operation of the inside work. In so doing the super will doubtless learn much that he did not know before. The knowledge will give him a broader view of matters and greatly assist in his improving conditions on the outside.

As time goes on, the superintendent's visits in the mine become more and more frequent. If he has an amiable disposition and is capable of establishing pleasant relations with the men in the mine, he will gain from them much valuable information, besides strengthening his own position as superintendent of the mine.

One of the prime causes of friction between a mine foreman and his superintendent is a disposition on the part of the latter to listen to tittle-tattle brought to his ears by this one or that one. All such gossip should pass unheeded by a superintendent, whose dealings with his foreman should be direct if confidence is to be established.

THREE LINES OF ACTION REQUIRED TO BUILD UP AN ORGANIZATION

Briefly outlined, there are three distinct lines in which the energies of a successful superintendent must be mainly exerted. These are: 1. To build an up-to-date, worth while organization. 2. To furnish adequate supplies of suitable material to enable the efficient operation of the mine. 3. To supervise wisely the general welfare work and living conditions of all employees.

The building up of an efficient organization will depend primarily on having a foreman who is both trustworthy and capable and who willingly and heartily co-operates with him in every respect. The superintendent must have confidence in the ability of his foreman and confer with him in a way that the foreman will not regard as interfering with his supervision and authority in the mine, which should be absolute.

The influence of a good superintendent is felt throughout the entire organization, from the mine foreman down to the humblest worker, whether that be a car-greaser or a trapperboy. Everyone has learned to regard him not as a meddler, but one who has the best interests of the men at heart and his visits to the mine are hailed with pleasure whenever he goes down.

WHAT IS REQUIRED TODAY

I read with interest the letter of John H. Wiley, *Coal Age*, Feb. 17, p. 321, and will say that his remarks are in line with present-day requirements in coal mining. The superintendent should have a practical knowledge gained by actual work in the mine; but this is not always the case with a good superintendent.

In what I have written it has been my endeavor to emphasize the need of wisdom on the part of a superintendent whose actual underground experience is limited. If I am not mistaken the day is not far distant, however, when mine superintendents will require the same certification that is now demanded of mine foremen and firebosses, as suggested by Mr. Wiley.

If we are to avoid terrible mine catastrophies there must be more technical knowledge and practical mining experience on the part of every mine official. Then such instances as the Hill Farm mine fire, when 31 lives were sacrificed, June 16, 1890, and many other similar disasters will cease. Competent men in charge underground must be given absolute control and supervision of all operations in the mine.

Gans, Pa. ROBERT W. LIGHTBURN.

Working Under Troublesome Roof

Roof falls often caused by pressure of gas in the overlying strata. Holes drilled in the roof relieve this pressure, by draining off the gas. Other suggestions regarding roof troubles.

AVOIDING roof troubles was the subject of an interesting letter by W. H. Luxton, *Coal Age*, Mar.17, p. 498. The difficulties he has mentioned and the means adopted to overcome them remind me of many experiences of my own. In instances, I have known the roof to fall badly while development was still in progress.

I recall working in a mine where the pressure of gas in the overlying strata made the roof heavy and gave much trouble, until we adopted the scheme of drilling holes up in the roof. This drained off the gas and relieved the pressure on the pillars, so that we were not troubled by the same frequent falls as before. We insisted on every miner putting up a hole in the roof each time a new cut was taken out at the face of the coal.

The suggestion of driving wider openings with a view to making the roof more elastic does not appeal to me as a good one. In that connection, Mr. Luxton advises driving entries 12 ft. in

width and standing posts along the side of the track.

While it is true, as he says, the plan avoids the payment of entry yardage and provides space for storing the waste, it must be acknowledged that posts set at the side of the track are an unnecessary hazard on haulage roads. Moreover, the saving of entry yardage may be more than counterbalanced by the cost for timbering.

Take Up Bottom for Headroom Rather Than Break Roof

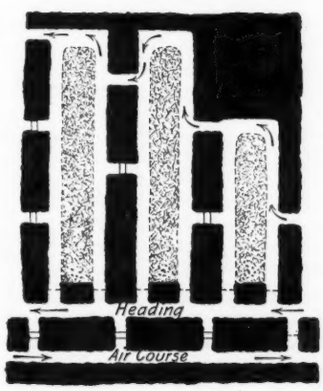
It has always been my practice to avoid breaking the roof wherever that is possible, even though it is necessary to take up bottom rock to gain headroom on the road. I have found it a great advantage, in mining seams where the coal is 8 ft. thick or more, to leave up 2 ft. of roof coal, in the first working, and take this down when drawing back the pillars. It will often avoid the need to double-timber.

The idea suggested of leaving a large percentage of coal in the first working is good whenever mining under troublesome roof. I have followed this plan in most instances, although companies often object to it as being expensive and delaying returns on the investment.

Thus far, I fail to understand what is meant by driving a "caving room" just behind and parallel to the back entry. In an experience of 12 years in the bituminous fields of South Wales and England, such a plan never came to my knowledge.

Wide Openings an Advantage

Speaking of wide openings, a plan that I have found that makes this possible and gives good results is to drive double rooms, after the manner shown in the accompanying figure. The plan gives ample opportunity for the roof to fall over a large area, thereby relieving the pressure on the pillars.



DRIVING DOUBLE ROOMS PROVIDES WIDE OPENINGS DESIRED

As shown in the figure, two roomnecks are turned off the heading and driven narrow for a distance of, say 4 or 5 yd. The intervening pillar is then cut through, forming a wide breast. This is driven forward in the usual manner, the coal being taken out on both the roads and the space between packed with waste.

One difficulty is that, in all narrow-work, little attention is too often given to the roof, until a large area has been developed and there are signs of trouble beginning. I recall an instance where a haulage road was driven 4,000 ft. without a set of timber being placed on the entire road.

Owing to the fact that the coal, in that case, was overlaid with 40 ft. of fireclay, trouble then began to manifest itself by numerous caves on the road. One fall followed another and kept the daymen busy cleaning up the road, till it was finaly decided to double-timber the entries throughout and there was no further trouble.

In the case mentioned, the coal was only 42 in. thick and it was necessary to take up bottom in order to gain the required headroom on the road. In the rooms crossbars were used over the roads, supported on a single post and hitched into the rib. Taking up bottom produced much waste, which was packed between the posts, while another wall was carried parallel to the other rib and about 6 ft. from it. This also proved an advantage in conducting the air to the face of the rooms. The road being carried along the straight rib also proved an advantage when the pillars were being drawn.

Plains, Pa. RICHARD BOWEN.

Inquiries Of General Interest

Centrifugal Pump Formulas

The Selection of a Centrifugal Pump for a Given Work Dependent on the Quantity of Water To Be Discharged Under a Given Head. Careful Proportionment Essential to High Efficiency

SOME time ago I recall seeing a number of formulas relating to centrifugal pumps but have since been unable to find them. The subject is one of great interest to me at the present time, and I want to request that this information be given again in the columns of *Coal Age*. I am particularly anxious to ascertain the proper proportionment of the parts and the sizes of pump and column pipe necessary to insure the highest efficiency in operation.

J. RUTHERFORD

Cumberland, B. C., Canada.

The principle of the action of a centrifugal pump is similar to that of a centrifugal fan. The impeller of the pump corresponds to the fan wheel. The rapid rotation of the impeller generates a centrifugal force in the water within the pump, whereby the water is thrown outward from the center to the circumference where it is conducted, by the volute casing, to the discharge portal and enters the column pipe.

The design is such as to convert the energy of the motor, transmitted through the shaft of the impeller and the curved blades, into kinetic energy, with as little loss as possible, which kinetic energy is then imparted to the water discharged in the column pipe. This is accomplished by gradually enlarging the area of passage in the volute of the casing surrounding the impeller and the connection to the column pipe. By that means the velocity of the water is reduced with a corresponding increase of pressure.

Experience has shown that a velocity of 12 ft. per sec., in centrifugal pumping, is required for heads varying from 80 to 90 ft.; and it is assumed that this velocity will vary approximately as the square root of the head. Estimating on this basis, the discharge G (gal. per min.) of a pump having a diameter d (in.) at the discharge portal and operating under a head h (ft.) is given by the equation:

$$G = \frac{60 \times 12 \times 12\ (0.7854\ d^2)}{231} \sqrt{\frac{h}{85}}$$

$$= 3.186\ d^2 \sqrt{h}$$

This gives for the diameter (d) in inches, of the discharge portal of a pump capable of discharging a number of gallons (G) per minute, under a head (h) in feet, the following formula:

$$d = \sqrt{\frac{G}{\sqrt{10\ h}}}$$

The diameter thus found is that of the discharge portal of the pump and is the number by which the pump is rated. For example, a No. 4 pump has a discharge portal 4 in. in diameter; a No. 5 pump, a discharge portal 5 in. in diameter, etc.

To illustrate, let it be required to find the size of pump necessary to discharge 1,600 gal. of water per minute, under a head of 400 ft. The number of this pump or size of its discharge portal is calculated by substituting the given values in the above formula; thus,

$$d = \sqrt{\frac{1{,}600}{\sqrt{10 \times 400}}} = \frac{40}{\sqrt[4]{4{,}000}}$$

$$= 5.03, \textit{ say } 5 \textit{ in.}$$

A No. 5 pump, therefore, is best adapted for this service. In estimat-

ing the size or number of pump required in a given case, it is important to remember that the highest efficiency is obtained when the required discharge bears a fixed proportion to the square root of the head. The No. 5 pump just estimated for delivering 1,600 gal. per min., under a head of 400 ft., would not give the same efficiency when working under a head of 500 ft., with the same discharge.

Calling the number of a pump N and writing this for d in the last formula given, the discharge (G) for any given head (h) and size of pump (N) is expressed by the formula:

$$G = N^2 \sqrt{10\,h}$$

Substituting in this formula the values large $N = 5$ and $h = 500$, we find for the necessary discharge of a No. 5 pump, under a 500 ft. head, to give the highest efficiency, as follows:

$$G = 5^2 \sqrt{10 \times 500} = 1{,}768 \text{ gal. per min.}$$

In all pumping practice, it is customary to estimate the diameter of the column pipe for a velocity of 400 ft. per min., which makes the diameter of the pipe, in inches, $\frac{1}{4}$ of the square root of the gallons discharged per minute, as expressed by the formula,

$$d = \tfrac{1}{4} \sqrt{G}$$

Unless careful attention is given to the proportionment of both the pump and the column pipe to the quantity of water handled and the head under which the pump must operate, there will always result a large loss in efficiency.

Examination Questions Answered

Examination, Foremen and Assistant Foremen, Twenty-first Anthracite District

(Selected Questions)

QUESTION—*Why will flame not pass through the gauze of a safety lamp?*

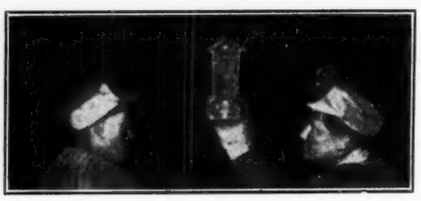
ANSWER—In its passage through the mesh of a gauze, the hot burning gas is cooled by its proximity to the cold metal of the gauze. When this cooling effect is sufficient to reduce the temperature of the burning gas below its point of ignition the flame is extinguished. This effect is greatly assisted by the entering gas being divided into numerous little streamlets, which are more readily cooled. However, as the heat of the burning gas is transferred to the metal of the gauze, the latter is heated and its cooling effect reduced, till finally the metal fails to abstract sufficient heat from the gas to prevent the passage of the flame.

QUESTION — *What produces blackdamp in mines, and what are its injurious effects on the workmen employed therein?*

ANSWER — Blackdamp is a variable mixture of carbon dioxide in the mine air and is produced by the complete combustion of carbonaceous matter in a plentiful supply of air. The chief sources of blackdamp in mines are the burning of lamps, breathing of men, mine fires, explosion of powder, gas or dust, and the slow oxidation of carbon in gob fires, decay of timber, etc. Its effect when breathed for a considerable time is to produce headache, nausea and pains in the back and limbs, followed by suffocation and death.

QUESTION — *How would you use a safety lamp when inspecting for gas; and how could you tell whether or not gas was present?*

ANSWER—Having carefully prepared the lamp before entering the mine and when about to make a test for gas lower the flame of the lamp to little more than one-eighth of an inch above the wick, or until the luminous portion of the flame has practically disappeared. Then, holding the lamp in an upright position, as illustrated in the accompanying figure, raise it cautiously



MAKING A TEST FOR GAS WITH A SAFETY LAMP

toward the roof, watching closely for any appearance of a faint non-luminous cap, or any increase in the height of the flame. In the use of the unbonneted Davy lamp burning a good quality of sperm, lard or cottonseed oil, the failure to detect a flame cap, by an experienced person, will show there is less than 2 per cent of gas present.

QUESTION—*If, in making your morning examination, you discover 10 in. of gas at the face and tailing back along the roof 20 ft., to a point, what would be your duty in such a case?*

ANSWER—If a reliable man is available, station him at the entrance to the place to prevent any one from approaching the face. But if no such person is at hand, bar the entrance with a suitable danger signal to warn anyone against entering the place. Then, having completed the examination of the section in charge, return to the bottom and enter a full report in the book kept for that purpose. This being done, remove the checks of the persons working in those places and the adjoining places where dangers have been found, and report the results of your examination at once to the foreman, giving him the checks retained to insure that no one will go to work in those places found to be unsafe.

QUESTION — *How should a person who has received an electric shock be treated?*

ANSWER — Assuming the person has been removed from contact with the wire, he should be at once taken to a nearby place where he will have good air and every effort made to restore normal breathing. If unconscious, artificial respiration should be promptly applied, preferably by the Schaefer or "prone method." To do this, the man is laid prone on the ground with arms stretched forward above his head and face turned to one side to allow a free passage of breath. The operator, then kneeling astride of the man's thighs, spreads both hands over the small of his back in a manner to bring pressure on the lower short ribs. It is important to see that the tongue is drawn forward in the mouth so as not to obstruct the throat and prevent easy breathing. The operator alternately swings forward and backward, at the rate of normal breathing, or, about 16 times a minute, thereby compressing and again expanding the lungs of the person, in an effort to induce and restore the action of breathing. This should be kept up until there are signs of returning life or the person is pronounced dead by a doctor.

QUESTION — *Why is it safer to approach accumulations of water under high pressure, than accumulations under low pressure?*

ANSWER — The near approach to an accumulation of water under high pressure gives warning by the observed seeping of the water through the pores of the coal and the interstices of the strata. This occurs before there is any danger of the coal giving way and allowing the water to flood the mine. Under a low pressure, no previous warning of this kind is given, and the miner breaks through suddenly into a body of water that may overwhelm him. In any case, when approaching places suspected of containing an accumulation of water or gas, drillholes should be kept from 15 to 20 ft. in advance of the face. No place should be driven more than 10 or 12 ft. in width, only safety lamps should be used and soft wood plugs should be kept ready to be driven into a hole the moment it has tapped the water.

Production Costs of Central Pennsylvania Mine Mount 358 Per Cent in 5 Years

THAT cost of production of coal has mounted greatly in recent years is clearly shown by the accompanying figures giving comparative costs in detail from a large operation in central Pennsylvania:

PRODUCTION COSTS AT A CENTRAL PENNSYLVANIA COAL MINE

Items	Costs in Cents per Gross Ton 1915	1916	1917	1920	Increase 1920 Over 1915 per Cent
Mining	47.815	60.213	86.097	118.081	246.9
Timbering	0.422	1.011	1.062	5.284	1,252.1
Yardage and deadwork	3.333	3.098	4.346	16.657	499.6
Roads	2.927	2.660	2.369	17.601	601.3
Drainage	0.839	1.670	1.418	4.685	558.4
Ventilation	0.336	0.589	0.798	2.395	712.7
Haulage	7.404	8.443	11.668	26.574	358.9
Dumping and shifting	2.800	2.675	4.453	6.426	229.5
Yard expense	.....	0.064	.....	0.099	154.6
Power	5.788	3.592	8.441	29.629	511.9
Mine office	1.328	1.721	2.389	2.324	175.0
Superintendence	1.379	2.025	2.948	9.446	684.9
Sundry	2.138	4.035	3.602	21.195	991.3
Mine overhead	17.499	16.004	39.429	34.023	194.8
General expense	1.617	4.093	2.327	44.865	277.4
Preparation	.....	.....	.....	3.118	.....
Repairs to buildings	.....	.....	.....	0.551	.....
Surveying	.....	.....	.....	0.296	.....
	95.625	111.893	171.347	343.249	358.9
Production in gross tons	131,036	153,537	129,602	144,207	.....

Shutdown of Washington Mines Redounds To Profit of British Columbia Operators

WITH winter over, Seattle fuel dealers have ceased to worry over the shutdown in the western Washington coal mines. Although the stocks of Washington coal that were on hand when the mines closed down have been pretty well exhausted, there has been no shortage, as imports of Utah and British Columbia coal were increased.

The shutdown of the mines, which came when more than 2,000 union mine workers refused to accept an average wage reduction of 24 per cent, has not affected the railroad mines of the Northern Pacific in eastern Washington, which are operating as usual and employing about as many men as are out of work in the commercial mines of the west side counties. The Great Northern is bringing between 300 and 400 tons a day into the state from the mines at Fernil, B. C., in which that road is interested, and the Milwaukee is using in its steam locomotives in the yards at Seattle and Tacoma nearly forty tons of coal a day from Roundup, Mont.

The shutdown in the Washington mines has put a neat little profit into the pockets of British Columbia mine owners, who not only mine their coal with cheap, non-union and Asiatic labor, but also are able to ship their product into the United States free of duty and also free of the 3 per cent war tax on freight payments that domestic coal pays.

Estimated Soft-Coal Output, January and February, 1921; Monthly Average, 1920[b]

(In Thousands of Net Tons)

	Monthly Average, 1920	January, 1921	February, 1921
Pennsylvania	13,583	11,465	8,930
Maryland	338	231	228
West Virginia	7,292	6,229	4,307
Virginia	821	518	408
Eastern Kentucky	1,722	1,712	1,352
Ohio	3,750	2,963	2,232
Michigan	120	125	98
Total	27,626	23,243	17,555
Illinois	7,504	7,147	5,354
Indiana	2,535	2,243	1,834
Western Kentucky	861	856	676
Total	10,900	10,246	7,864
Tennessee	563	454	371
Alabama	1,391	1,338	1,068
Total	1,954	1,792	1,439
North Dakota	64	56	54
Iowa	764	610	506
Missouri	479	433	310
Kansas	558	508	399
Oklahoma	350	230	173
Arkansas	193	157	119
Texas	150	102	81
Total	2,558	2,096	1,642
Colorado	1,008	981	706
Montana	370	279	283
Wyoming	833	694	598
Utah	489	397	309
New Mexico	313	262	203
Total	3,013	2,613	2,099
Washington	313	270	244
Other States (a)	16	10	8
Total	329	280	252
Grand total	46,380	40,270	30,851

(a) Includes Alaska, California, Georgia, Idaho, North Carolina, Oregon, and South Dakota. (b) Estimates by Geological Survey.

Estimated Monthly Production of Soft Coal, 1920, by Groups of States[b]

(In Thousands of Net Tons)

	January	February	March	April	May	June	July	August	September	October	November	December	Total
Pennsylvania	13,706	11,232	13,502	10,854	10,899	12,866	13,523	15,352	14,872	15,687	14,893	15,614	163,000
Maryland	302	216	368	306	302	288	365	375	395	392	393	348	4,050
West Virginia	7,215	5,630	7,279	6,247	6,388	6,979	7,808	8,254	8,172	8,195	7,817	7,516	87,500
Virginia	1,050	756	939	866	863	876	734	719	766	786	760	735	9,850
Eastern Kentucky	1,787	1,522	1,634	1,354	1,534	1,587	1,854	1,871	1,783	1,800	1,953	1,987	20,666
Ohio	3,639	2,950	3,553	2,890	3,272	3,884	3,814	4,098	4,170	4,255	4,218	4,257	45,000
Michigan	155	117	123	123	81	127	115	115	115	117	115	137	1,440
Total	27,854	22,423	27,398	22,640	23,339	26,607	28,213	30,784	30,273	31,232	30,149	30,594	331,506
Illinois	8,276	7,128	8,269	6,128	6,096	7,364	6,059	7,262	7,606	8,487	8,577	8,798	90,050
Indiana	3,023	2,184	2,450	1,684	1,724	2,670	2,120	2,224	2,842	3,112	3,147	3,240	30,420
Western Kentucky	893	761	816	677	768	794	927	936	892	899	977	993	10,333
Total	12,192	10,073	11,535	8,489	8,588	10,828	9,106	10,422	11,340	12,498	12,701	13,031	130,803
Tennessee	651	495	564	490	522	569	567	560	498	596	603	635	6,750
Alabama	1,589	1,282	1,435	1,279	1,375	1,394	1,452	1,348	1,238	1,430	1,453	1,425	16,700
Total	2,240	1,777	1,999	1,769	1,897	1,963	2,019	1,908	1,736	2,026	2,056	2,060	23,450
North Dakota	85	63	59	53	40	43	50	66	62	75	95	79	770
Iowa	880	787	855	723	689	770	650	683	688	817	806	822	9,170
Missouri	565	482	550	417	465	445	455	436	477	485	462	511	5,750
Kansas	698	557	640	495	552	554	458	365	530	629	604	618	6,700
Oklahoma	426	355	345	325	330	330	340	350	317	355	375	352	4,200
Arkansas	219	177	202	147	172	193	206	203	186	207	210	188	2,310
Texas	182	133	128	146	152	169	173	168	122	138	144	145	1,800
Total	3,055	2,554	2,779	2,306	2,400	2,504	2,332	2,271	2,382	2,706	2,696	2,715	30,700
Colorado	902	1,045	743	818	878	1,050	1,056	1,094	1,059	1,078	1,185	1,192	12,100
Montana	467	372	340	326	261	308	333	416	346	420	448	403	4,440
Wyoming	939	795	798	655	678	707	795	882	903	975	955	918	10,000
Utah	302	524	539	350	413	530	575	530	500	506	573	528	5,870
New Mexico	340	293	337	272	266	297	301	316	317	322	345	344	3,750
Total	2,950	3,029	2,757	2,421	2,496	2,892	3,060	3,238	3,125	3,301	3,506	3,385	36,160
Washington	380	311	345	299	257	304	265	273	302	363	331	320	3,750
Other States (a)	18	14	19	14	16	16	14	14	14	18	18	18	193
Grand total	48,689	40,181	46,832	37,939	38,993	45,114	45,009	48,910	49,172	52,144	51,457	52,123	556,563

(a) Includes Alaska, California, Georgia, Idaho, North Carolina, Oregon and South Dakota. (b) Estimates by the Geological Survey.

Roads Move 110,522,086 Tons of Bituminous Coal During Last Quarter of 1920

BITUMINOUS coal mines of the country furnished the Class 1 railroads 110,522,086 tons of revenue freight during the last quarter of 1920. The figures are those of the Interstate Commerce Commission. They form a part of its quarterly statement covering seventy commodities. Incidentally bituminous coal furnishes by far the greatest tonnage of any item on the list. Next in importance as a tonnage producer is the item made up of clay, gravel, sand and stone. Some of the other items in the order of their importance as tonnage producers are as follows: Anthracite coal, iron ore, logs, wheat, refined petroleum, structural iron.

The total tonnage of anthracite coal carried during the quarter covered by the figures was 21,224,244. The coke tonnage was 6,871 501.

The Eastern district furnished 61,624,973 tons of bituminous coal to the railroads to be hauled as revenue freight. The Western district came next with 19,298,817 tons. The Southern district was in third place with 15,458,473 tons. The Pocahontas district furnished 14,139,823 tons.

The coke tonnage was divided as follows: Eastern district, 5,348,549 tons; Pocahontas district, 425,668 tons; Southern district, 539,791 tons; Western district, 557,493 tons.

March Coal Exports Greatly Reduced

BITUMINOUS coal exports in March, 1921, from the United States, as reported by the Bureau of Foreign and Domestic Commerce, amounted to 1,151,840 gross tons, compared with 1,500,540 tons for the corresponding month of 1920.

Exports of anthracite, which go mainly to Canada, declined to 307,940 gross tons from the March, 1920, figure of 419,682 tons. Coke exports dropped 55,435 to 25,061 gross tons.

IMPORTS AND EXPORTS OF COAL AND COKE BY THE UNITED STATES, MARCH, 1921, IN GROSS TONS

IMPORTS	Mar., 1921
Coal:	
Anthracite	1,697
Bituminous	83,100
Imported from:	
Canada	71,883
Japan	9,543
Australia	1,443
Coke	3,853

EXPORTS	Mar., 1921
Coal:	
Anthracite	307,940
Bituminous	1,151,840
Exported to:	
France	37,728
Italy	71,517
Netherlands	26,881
Sweden	6,839
Canada	591,557
Panama	19,657
Mexico	12,687
British West Indies	1,449
Cuba	74,963
Dutch West Indies	1,335
Argentina	68,562
Brazil	52,801
Chile	26,783
Azores and Madeira Islands	1,543
Czecho-Slovakia	6,722
Denmark	6,577
Gibraltar	40,192
Greece	7,610
Spain	800
England	7,683
Bermuda	4,594
British Honduras	199
Guatemala	1,046
Honduras	1,322
Colombia	1,451
Ecuador	2,376
French Africa	8,130
Egypt	68,748
Other countries	88
Coke	25,061

Development Lags in Eastern Kentucky

WHILE there have been a few new coal companies formed in eastern Kentucky during the past few months and there is talk of developments, reports from the field show that about the only new work in evidence is the finishing up of work already started. Some land deals are being made, but there is little new development work looking toward early production of coal.

Although many mines have been idle or only working part time, necessary repairs are about all that has been undertaken, due to uncertainty concerning future markets, high costs of machinery and materials, and the fact that the larger companies have not much hope of operating their plants to present capacity basis, and the small mines and wagon mines will not risk much in improvement.

The situation in eastern Kentucky is a peculiar one, in that increased production capacity wouldn't help the operator much even if he could obtain business, because he can get it only when everyone else is able to obtain production, and under such conditions there is either a shortage of cars, due to actual scarcity, or else the obsolete coal-carrying lines of eastern Kentucky are not equal to handling the tonnage offered by the shippers. The Hazard lines are totally unable to handle capacity production of that field, and have not been able to handle it for some years. The situation in the Harlan field is not much better. Of course, large capacity means larger car allotment, which would aid some in time of good demand.

The principal companies are building practically no new miners' homes or buildings of any kind, and are making few changes of interest. C. L. Ryley, Lexington, Ky., of the Happy Coal Co. and No. 4 Superior Coal Co., has been in the market for equipment for some of his new mine operations. The Bailey Ferguson Coal Co., Prestonburg, Ky., is planning to buy full equipment for a 1,500 acre coal land development, including cars, motors, mining machinery, boilers, engines, fans, screens, tipples, etc. The Ryley interests, of Lexington, contemplate some development, and have been asking for quotations on necessary machinery.

As a whole development work in eastern Kentucky this year will be largely in the line of railroad work. Several big improvements are planned by the Louisville & Nashville and there are some short railroad lines in process of formation to aid in handling increased tonnage and make better connections, some of these lines tapping excellent coal areas.

Temporary Anthracite Rates in New England Pending Final Readjustment

PENDING final determination of the question of readjustment of rates on anthracite coal to points in New England, the Coal and Coke Committee of Trunk Line Territory has announced that as a temporary expedient new rates will be issued to various points on the Boston & Albany R.R. and Boston & Maine R.R., effective May 20, and to points on the New York, New Haven & Hartford R.R. effective on June 1.

Hearings on the proposed adjustment of rates were held in New York on Feb. 3 and in Boston on March 3.

The rates to Boston, East Boston, Chelsea, Everett, East Cambridge, Cambridge, Brookline, Brighton and Cambridgeport on the Boston & Albany R.R. will be as follows:

From	Prepared Sizes	Pea	Buckwheat No. 1	Buckwheat No. 2 and Smaller
Delaware & Hudson Co.	$4.62	$4.20	$3.78	$3.78
N. Y. O. & W. Ry.	4.76	4.20	3.78	3.78
Erie R.R.	4.76	4.62	4.62	4.62
Penna. R.R.	5.74	5.46	5.46	5.46
L. & N. E. R.R.	4.76	4.76	4.76	4.76
C. R.R. of N. J.	4.76	4.76	4.76	4.76
Lehigh Valley R.R.	4.76	4.76	4.76	4.76
Phila. & Reading Ry.	4.76	4.76	4.76	4.48

To Boston, Chelsea, Everett and Cambridge on the Boston & Maine R.R. from the Delaware & Hudson Co. the rate on prepared sizes will be $4.62; pea, $4.34; buckwheat No. 1, $4.06 and buckwheat No. 2 and smaller, $3.78. There will be no change in rates of other originating lines.

From the Delaware & Hudson Co. to Worcester, Ware, Gilbertville and Bondsville on the Boston & Maine, the rate on prepared sizes will be $4.90; pea, $4.34; buckwheat No. 1, $4.34 and buckwheat No. 2 and smaller, $3.92. There will be no change in rates of other originating lines.

Rates from originating points on the various roads to Boston, via the New York, New Haven & Hartford follow:

	Boston, Mass.			
From	Prepared	Pea	No. 1	No. 24 and Smaller
D. & H. Co.	$4.62	$4.48	$4.48	$3.92
N. Y. O. & W. Ry.	4.62	4.48	4.20	3.64
Erie R.R.	4.62	4.62	4.62	4.62
P. R.R.	4.62	4.62	4.62	4.62
L. & N. E. R.R.	4.62	4.48	4.20	4.06
C. R.R. of N. J.	4.62	4.48	4.20	4.06
L. V. R.R.	4.62	4.48	4.20	4.06
P. & R. Ry.	4.62	4.62	4.62	4.62

THE DEPARTMENT OF AGRICULTURE has requested Congress to appropriate $9,000 for fuel for the balance of the year to July 1. It points out that only $10,000 was appropriated, whereas $19,500 had been estimated for. It states that fuel purchased by it from the Government Fuel Yard in March was at $9.22 a ton, and that for April, May and June it is estimated to cost $8.50 a ton.

I. C. C. Grants Cut in Freight on Lake Coal; Virtually Seasonal Rating; Fruit Shippers May Ask Reduction

By Paul Wooton
Washington Correspondent

By authorizing the carriers to put into effect reduced rates on Lake coal, the Interstate Commerce Commission has authorized what is in effect a seasonal coal rate. The decision is regarded as being one of the most significant since the priority orders of last autumn. The authorization took the form of special permissions. Such permissions, No. 52,757 and No. 52,761, dated April 27, authorized the carriers participating in the movement of coal to Lake Erie ports for transshipment by water to publish on not less than five days' notice the following provision in their tariff:

"Upon representation of proof to delivering line that coal shipped hereunder has been loaded into vessels at Lake Erie ports specified in this tariff and discharged from vessel at west bank Lake Michigan ports north of the Illinois-Wisconsin State line, to and including Manistique, Mich., or Lake Superior ports west of White Fish Point, Mich., including Port Arthur and Fort William, Ontario, Canada, the rates on coal so delivered will be 28c. per net ton less than the rates on coal for transshipment via Lake as cargo named in this tariff. Protection of such rates to be accomplished by readjustment of charges after presentation of the proof above specified. Expires at midnight on Oct. 31, 1921, unless sooner cancelled, changed or extended."

This order is expected to stimulate the shipment of coal to lower Lake ports. It is expected to be of the greatest advantage to coal operations in Ohio, West Virginia and western Pennsylvania. Shipments from Illinois and Indiana fields to the Northwest probably will be affected adversely. Adjustment of the rates from the Upper Lake ports to interior points still is under discussion. The Louisville & Nashville R.R. asks that the privilege be extended to it.

The matter of adjusting Lake rates has been the subject of conferences since last September. The more recent conferences between Lake coal shippers and railroad officials resulted in an agreement on the part of the carriers to the adjustment, whereupon at a conference with the Commerce Commission it was decided to issue the foregoing order.

It is certain that California fruits and other commodities in need of seasonal reductions will seize upon this as a precedent on which to demand similar reduction.

So far as coal rates are concerned, greatest interest centers on the probable action which will be taken by the industry in Illinois and Indiana.

National Coal Injunction Is Continued; Ruling Delayed

Justice Hitz Orders Submission of Government Brief in 10 Days—Association Allowed Similar Period to Reply

PENDING a study of the legal questions involved in the National Coal Association's injunction suit, the temporary injunction is to remain in effect. A ruling in the matter may be delayed from three to six weeks.

Arguments in the suit began April 25 before Justice Hitz in the Supreme Court of the District of Columbia. The arguments lasted throughout the whole of two days. At the close of the argument Justice Hitz took the case under advisement and suggested that counsel submit briefs. He directed that the government should have ten days within which to file its brief and the National Coal Association ten days additional in which to file its reply.

L. Ert Slack, an Assistant Attorney General, and Charles W. Arth, Assistant U. S. Attorney for the District of Columbia, appeared for the government. Owing to the importance of the case it had been expected that the defendants would be represented by some of the distinguished lawyers attached to the Washington office of the Department of Justice. Major Bullitt of Philadelphia was given permission to intervene in the interest of Colonel D. B. Wentz, who was allowed to become an additional party to it.

Summed up briefly the government contended that the bill of complaint should be dismissed on the ground that it was in effect a suit against the United States. It also was contended that it was an attempt to have a court of equity enjoin a criminal prosecution.

The attorneys for the National Coal Association based their case on the general proposition that their bill of complaint was filed to protect the constitutional rights of the plaintiffs. They contended that all parties accused of a criminal offense, whether they be individuals or corporations, have the constitutional right to a full hearing on the question of probable cause before being compelled to appear in a foreign jurisdiction for trial. So far as a corporation is concerned, it was declared, a court of equity is the only place it can get such a hearing.

It was pointed out that the District of Columbia court by taking jurisdiction will avoid multiplication of proceedings and vexatious litigation that would be involved in separate removal proceedings against Messrs. Wentz, Morrow and Couffer.

Counsel for the National Coal Association also contended that the government officials are acting beyond their authority because they threatened service of process on the National Coal Association not authorized by any act of Congress and because the Sherman Act, on which the indictment is based, was superseded by the Lever Act and is inoperative so far as the coal industry and the acts complained of are concerned. It was further contended by the lawyers for the National Coal Association that this is not a suit to enjoin criminal prosecution, as contended by the government, but one merely to secure to the plaintiffs the constitutional right to a full preliminary hearing on the question of probable cause in the district of their domicile.

Tidewater Coal Exchange Members to Pay Annual Dues of $300

MEMBERS of the Tidewater Coal Exchange, Inc., have been notified that, effective May 1, 1921, they will be obliged to pay annual dues of $300, payable $75 quarterly, in advance, the money so received to be applied toward the total members' portion of the maintenance of the exchange, all members' share of expenses over and above that covered by annual dues to be prorated on a tonnage basis. The resolution providing for the payment of dues was adopted by the Board of Directors at their meeting on April 7, and the Executive Committee at a meeting held on April 21 amended rule 1 of the rules and regulations of the exchange to conform with the resolution adopted by the Board of Directors.

THE ARMY APPROPRIATION BILL for the year beginning July 1, reported to the House by the Appropriations Committee, carries $5,225,000 for fuel for the army and $85,000 for fuel for the West Point Military Academy, with a provision authorizing the War Department to contract for and pay for supplies in advance of availability of appropriations therefor.

Amount and Value of Coal Exports from the United Kingdom During March and First Quarter of 1913, 1920 and 1921

	Quantity (Tons) — March			Value — March		
	1913	1920	1921	1913	1920	1921
Anthracite	216,151	182,216	87,120	£169,245	£544,980	£198,660
Steam	4,144,761	1,952,595	1,436,330	2,911,046	7,708,002	3,109,975
Gas	833,547	176,450	348,626	497,520	698,411	796,387
Household	141,867	8,494	15,317	90,618	12,391	34,097
Other sorts	262,448	86,396	80,685	160,105	286,438	142,758
Totals	5,598,774	2,406,151	1,968,078	£3,828,534	£9,250,222	£4,281,877
	Three Months ended March			Three Months ended March		
	1913	1920	1921	1913	1920	1921
Anthracite	701,516	477,167	309,004	£562,253	£1,391,905	£981,397
Steam	12,609,068	6,907,315	4,010,521	8,752,520	25,651,798	10,345,748
Gas	2,610,246	635,268	850,768	1,533,254	2,308,684	2,231,727
Household	435,454	24,917	28,073	277,493	60,362	71,660
Other sorts	882,725	321,102	198,966	544,430	1,073,322	447,673
Totals	17,239,009	8,365,769	5,397,332	11,669,950	30,486,071	14,078,205

Destination of Coal Exports from United Kingdom, March 1913, 1920 and 1921

	Quantity (Tons) — March		
	1913	1920	1921
Russia	111,338	3,914	.....
Sweden	281,468	160,759	78,853
Norway	201,410	77,249	44,587
Denmark	252,905	106,490	148,599
Germany	615,008	.....	67,732
Netherlands	166,439	9,686	113,713
Belgium	220,687	91,169	10,938
France	1,072,300	1,184,031	437,659
Portugal	88,230	18,011	29,024
Azores and Madeira	7,906	7,071	4,341
Spain	233,147	27,810	127,642
Canary Islands	88,667	35,822	6,916
Italy	841,966	204,290	332,480
Austria-Hungary	118,498	2,953	.....
Greece	49,598	10,988	37,083
Algeria	112,917	70,853	64,623
French West Africa	14,840	20,380	10,919
Portuguese West Africa	16,769	15,984	13,926
Chile	48,076	418	179
Brazil	206,160	12,733	6,097
Uruguay	53,526	13,261	31,972
Argentine Republic	290,459	39,075	98,520
Channel Islands	8,967	17,281	7,075
Gibraltar	42,584	120,719	54,176
Malta	94,005	34,809	9,126
Egypt	183,000	70,160	66,857
Anglo-Egyptian Sudan	.....	.....	3,008
Aden and Dependencies	4,978	4,847	13,672
British India	34,328	59	27,049
Ceylon	23,067	5,682	25,239
Other countries	115,531	39,647	96,073

British Strike Still Drags Along Despite Government Offer of £10,000,000 Bribe

LIBERAL offers on the part of the operators of the British coal mines, made on April 25, apparently in no degree brought nearer the end of the strike, and the only hope seems to rest in assuring the mine workers that their faith in ultimate and complete victory is vain. Even an offer by the government on April 28 to subsidize the industry out of the pockets of the taxpayers £10,000,000 per annum, with the guarantee that the wage reduction will not exceed 3s. (72.9c.) per shift was without result.

On April 26 at a three-hours conference in which the government, the mine operators and mine workers took part, the owners of the mines made the following proposals: (1) That for a temporary period any change in wages shall be on a flat-rate basis in each area; (2) that the wage rate shall be calculated on the area instead of on the district basis and (3) that the owners shall forego profits for three months.

The mine workers answered these offers as follows: (1) The mine workers' demands for flat-rate advances and reductions on a national basis are in no way met; (2) the areas are only a minor variation from the old districts and (3) capital, having always based its claim to reward on the assumption that it takes the risks of industry, should bear losses in times of depression as it reaps profits in good times.

The employees' representatives are strongly of the opinion that the mine operators should be willing to operate at a loss. When the operators agree to forego profits the labor leaders say "That is no concession; you are making no profits now," which, of course, is really not true, as the operators have not controlled the mines for some years and had them returned to them only on April 1, when the strike commenced. The government held them till April 1 and stood the losses, paying profits to the operators and wages to the mine workers. The operators say, merely as a basis of argument, that if those of them which make profits must pay them over to the mine workers where less than a minimum wage would otherwise be paid, those employees who make more than a minimum wage should be willing to pay those who make less.

The operators, while admitting that this would make for inefficiency, declare that any arrangement that makes one operator who mines at a profit participate in the payment of the employees of another operator who would otherwise mine at a loss will similarly make the otherwise successful operator indifferent as to the efficiency of his methods and the mine owner who operates at a loss also inefficient because the loss is no matter of his but of the man who makes a profit. Equalization of any kind may look just, but it results in inefficiency and in the end is unjust to everybody.

Mine Costs, $7.62; Selling Price, $6.26

Sir Robert Horne, Chancellor of the Exchequer, said that during the last month of government control of mines, March, there was a loss of £5,259,209 ($25,612,348 at normal rate of exchange) on the month's working. Coal cost 39s. 1d. ($9.52 at normal exchange and $7.62 at $3.90 exchange). Of this, 27s. 9d. was paid as wages ($6.76 normal exchange or $5.41 with exchange at $3.90). The price at which the coal was sold was 32s. 1d. ($7.81 or $6.26). The cost of production was figured for the actual expenditures involved, without any allowance for mine owners' profits, depreciation or interest.

On April 27 the government showed its disposition to make concessions if, by any means, the strike might be more speedily ended. Conditions throughout the nation were bad, the National Union of Railwaymen having only the day before instructed its members not to handle coal from colliery sidings or overseas. Although on the following day this order was modified in favor of public utilities, the number of trains running was only one-third that before the strike. Street lighting had received a 50-per cent cut. Many London firms, including the underground railroads, were considering the substitution of oil for coal, not only in this emergency but to take care of similar conditions in the future.

In view of these difficulties the government offered to contribute £500,000 monthly for a limited period, provided the average wage reductions should not be more than 3s. (73c. or 58.5c.) a shift. The next day the government offered £10,000,000 ($48,700,000 or $39,000,000) to guarantee that the same average wage reduction would not be exceeded in May, nor more than 3s. 6d. (85c. or 68c.) in June, the balance of the sum being used to alleviate as far as may be the severity of the reductions in July and August. This did not satisfy the mine workers' representatives. They broke up the conference and went to the coal fields to report and to receive a vote from their

constituency. It is reported that only a small majority favored the rejection of the government's offer. A few miners have gone back to work.

When the representatives returned to the field and presented their case, the leaders of the Lanarkshire Miners' Union decided not to call for a vote, so certain were they that the majority of men in that Scottish county would favor the continuance of the strike. The Lancashire and Cheshire Miners' Federation passed resolutions supporting the decision of their representatives, and the Notts Miners' Association and the Forest of Dean mine workers at a mass meeting at Merthyr, in Wales, also determined that the fight must be continued till victory was achieved. Other executive committees passed similar resolutions. Nowhere did it appear that a vote was desired, and at Porth, in South Wales, 12,000 mine workers met and decided to make an attempt May 2 to withdraw all the safety men working in the Rhondda district. Mass picketing is to be begun around the pits in the hope that thereby the volunteers may be terrified or dissuaded from entering the mines.

Frelinghuysen Rewrites Commissioner Bill; Now an Ostensible Aid to Stabilizing Coal Industry

BY WASHINGTON CORRESPONDENCE

AFTER extended discussion before the full membership of the Interstate Commerce Committee of the Senate Senator Frelinghuysen has rewritten his coal commissioner bill, which now becomes a bill "to aid in stabilizing the coal industry." The revised bill vests practically all of the provisions of the coal commissioner bill in the Secretary of the Interior. The appropriation is increased from $50,000 to $200,000. The provisions of the bill are to apply, in addition to anthracite and bituminous coal, to "semi-anthracite, sub-bituminous, lignite, and coke."

It is the intention of Senator Frelinghuysen to hear a few specialists but general hearings on the measure are not to be reopened. J. D. A. Morrow has been invited to present his views and James Barbour, a traffic specialist from Canton, Ohio, who is in the service of a large consuming manufacturing industry, also is to be heard.

It is thought to be the idea of the Secretary of Commerce that the fact-finding in regard to coal should be vested in his department. It is known to be Secretary Hoover's idea that the reporting of certain essential facts as to the production, distribution and consumption of coal should be made compulsory. His thought in the matter is said to be that there should be certain simple returns on fundamental matters, such as production, stocks, available transportation equipment, as well as information as to prices and costs. He would, however, divest the fact-finding of any regulatory function.

If lodged in the Department of Commerce, the work naturally would be assigned to the Bureau of the Census. The idea frequently has been advanced that the collection of purely commercial statistics should be vested in other than scientific bureaus. It also is being urged that the collection of information as to zoning and transportation matters should be assigned to the Interstate Commerce Commission. The scientific and technological investigations covered by the Frelinghuysen bill would be left with the Secretary of the Interior for assignment to the proper bureau in his department.

Extracts from the revised bill are as follows:

Sec. 5. That the Secretary of the Interior shall investigate from time to time conditions affecting the organization, management, and practices of dealers and operators, costs and profits in connection with the mining, sale and distribution of coal, the terms contained in leases of coal mines, the prices demanded or received for coal, the distribution, storage, and sale of coal, and the methods and processes employed therein, the consumption of coal, and the transportation of coal in commerce, including the distribution of coal cars.

Sec. 6. That the Secretary shall investigate, from time to time, the wages, working conditions and practices, terms of employment, and the living expenses of miners and other workmen employed in mines, washeries, coking plants and other plants pertinent thereto from which coal is transported in commerce.

Sec. 7. That the Secretary shall investigate, from time to time, methods and processes for the storage, inspection, sampling, analysis, purchase, classification and economic utilization of coal and conduct such experiments and researches as he may find advisable to determine the most efficient means for such storage and other processes involved in the preparation, transportation, and utilization of coal.

Sec. 8. That the Secretary shall file, analyze and compile all data and information obtained under sections 5, 6 and 7 and shall keep such data and information revised currently and available for immediate reference. He shall publish from time to time, in such form as he deems proper, such portions of the data and information obtained thereunder, except trade secrets or names of customers, as he may deem advisable in the public interest.

Sec. 9. That the Secretary shall, on request, and to the extent that he deems proper in the public interest, place at the disposal of any private or public board, commission, or other group engaged in the arbitration, conciliation, or settlement of any labor dispute arising in any mine from which coal is shipped in commerce, all data and information in the files of his office relating to the matter in controversy. The Secretary shall co-operate with the Interstate Commerce Commission in promoting the proper distribution and most efficient use of coal cars in commerce. He shall also cooperate with dealers, consumers, and others to encourage the construction of facilities for the storage of coal, and for its utilization.

Sec. 10. That the Secretary shall investigate the desirability and practicability of prescribing standards for various kinds and grades of coal prepared for the market, and shall submit a report thereon to Congress on or before December 5, 1921, accompanied by such recommendations as he may deem proper.

Sec. 11. That the Secretary shall investigate the desirability and practicability of a statutory zoning system defining the distance from the mine within which coal therefrom may be transported in commerce, and shall submit a report thereon to Congress on or before December 5, 1921, accompanied by such recommendations as he may deem proper.

SECRETARY GIVEN WIDE SUPERVISORY POWERS

Sec. 16. That the Secretary may prosecute any investigation authorized by this Act, personally or by such examiners as he may designate for that purpose, in any part of the United States. For the purposes of this Act the Secretary, or his duly authorized agents, shall at all reasonable times have access to and the right to examine the mines, washeries, yards, equipment, offices and other places of business of any operator or dealer, and (to sample the coal at any place) and shall have access to and the right to copy any books, records, papers, correspondence, or any entries therein, of any operator or dealer. Any operator, dealer, or other person who shall neglect or refuse to permit the Secretary or any duly authorized agent thereof to have access to, and to examine any such mine, washery, yard, equipment, offices or other place of business and to sample the coal at any place or to have access to or an opportunity to copy any book, record, paper or correspondence or any entry therein, for the purposes of this Act, shall be guilty of a misdemeanor, and shall on conviction be punished by a fine of not more than $1,000 or by imprisonment for not more than six months, or by both.

Sec. 23. That the Secretary shall have power, by general or special orders, to require operators and dealers, or any of them, to file with him in such form as he may prescribe, annual and special reports or answers in writing to specific questions, furnishing to the Secretary such information as he may require as to the organization, practices, management, relation to other persons, costs, prices and profits of the operator or dealer so required to report or answer questions. Such reports and answers shall be made under oath or otherwise, as the Secretary may require, and shall be filed with the Secretary within such reasonable period as he may prescribe, unless additional time is granted in any individual case by the Secretary.

Sec. 27. That all laws and parts of laws in conflict with the provision of this Act are hereby repealed.

The seasonal freight rate bill also will be revised, it is believed. It now seems probable that the bill will be drawn so that the matter of granting seasonal rates will be left entirely to the Interstate Commerce Commission.

Although Industry's Coal Pile Is Dwindling, Stocks Are Nearly as Large as Two Years Ago

Public Utilities and Retail Coal Dealers Have Large Accumulations—Railroads' Supply Is Normal—Iron and Steel Trades Lack Storage Sufficient for Business Boom—Industrials Using More Coal Than They Are Buying

STOCKS of coal are significant because they are the consumers' reserve against a possible interruption in supply. Such interruptions have occurred in the past through mine strikes, traffic congestion on the railroads, or severe weather interfering with the delivery of loaded coal. When stocks are large, consumers can delay purchasing until offered favorable terms. Small stocks, on the contrary, drive many consumers to enter the spot market and conduce to higher prices. The condition of stocks, therefore, has an important effect on the coal market and is a matter of consequence to all who buy and sell coal in quantity.

The following is the preliminary report on stocks of coal in the United States prepared by F. G. Tryon, of the U. S. Geological Survey, for the first quarter of 1921. This is the third year in which a survey on this very important subject has been made, previous reports having been made in the spring of 1919 by the Fuel Administration, and last year by the Geological Survey.

The questionnaires on which this report is based were mailed March 31. The replies, received up to Wednesday, April 27, are summarized herewith. Grateful acknowledgments are extended to the thousands of producers, distributors, and consumers who have furnished information. The report is subject to revision. Additional data will be presented in detail in the Geological Survey's weekly report on coal production, and a final report on stocks will be issued when the returns are complete.

In considering stocks a sharp distinction must be made between anthracite and bituminous coal. Although the two fuels are in competition, the businesses of mining and distributing them are so distinct as to be practically separate industries.

Current Bituminous Output and Consumption

Production of bituminous coal declined steadily from December, 1920, to the end of the coal year, March 31. In late March and early April the soft-coal mines were working on the average only two or three days a week. Mine capacity (not theoretical but proven) and demonstrated transportation facilities sufficient to produce another 6,000,000 tons of coal every week were and still are lying idle.

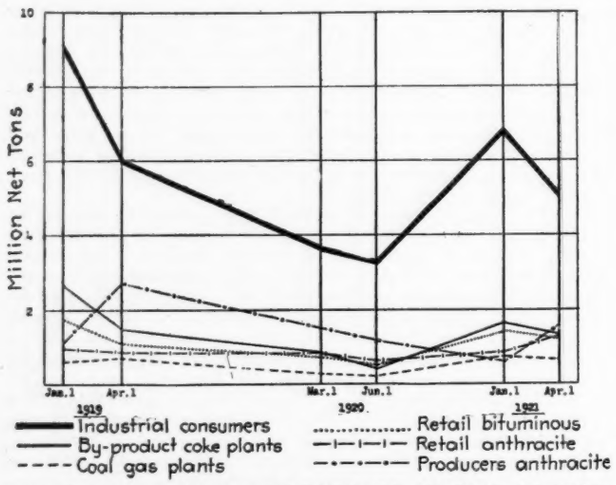


FIG. 1. FLUCTUATIONS IN TONNAGE OF COAL IN STORAGE, JAN. 1, 1919, TO APRIL 1, 1921

Lines in diagram show tons on hand at selected lists of establishments on dates mentioned. The lists are incomplete but as the same establishments are included for the several dates the figures are comparable.

An army of men dependent on the mines for livelihood are unemployed, or at best working but a few hours a week. From a maximum of 12,800,000 tons a week in December, production had sunk to a bare 6,000,000 tons, the lowest point (except of course, for the great strike of 1919) touched since April, 1914. Indeed, if the growth in the country's requirements during the past seven years be considered, the present depression in the soft-coal industry is more acute than that of 1914, and one must go back to the panic of 1893 to find its parallel.

At first thought this profound slump in production might give ground for alarm as to the sufficiency of next winter's supply of coal. Before, however, it is assumed that the slump in output foretells a shortage of coal, two other facts must be taken into account. The first fact is that the slump was preceded by several months of heavy production, which brought the total output in 1920 up to 556,000,000 tons, exceeding even the war year, 1917, and approaching the record production of 1918—579,000,000 tons. Not all of this large output was consumed or exported. Some millions of tons of it were added to consumers' stocks, and it was to be expected that these stocks would be drawn upon during the late winter. The second fact to be remembered is that the slump in output was accompanied by a great cut in consumption. While complete data on current consumption are lacking, there is enough evidence to show that the combined domestic consumption and exports during the first quarter of 1921 were 20 per cent less than during the first quarter of 1920. Comparing the month of March, 1921, with March, 1920, the decrease was about 30 per cent.

Production Falls Below Consumption

Piecing together the available facts concerning production, consumption and stocks, it appears that the output during the first quarter of the year 1921 was 100,000,000 tons; that consumption and exports were in round numbers 108,000,000 tons, and that the deficit between production and consumption was made up by a draft upon consumers' stocks of about 8,000,000 tons. Moreover, this draft upon stocks did not end with March 31. Although the returns for the week ended April 23 show an increase in production (6,829,000 tons as against 6,457,000 in the last week of March), the total output for April will fall short of the total consumption. Six million eight hundred and twenty-nine thousand tons a week is not enough to meet our current requirements, even in the present atmosphere of business depression.

Stocks.—A final estimate of the total stocks on hand cannot be made until more complete returns are received from consumers. It is, however, possible to state that the stocks on hand as of Jan. 1, 1921, were somewhere between 42,000,000 and 48,000,000 tons—say 45,000,000—and that on April 1 they had fallen to somewhere between 34,000,000 and 39,000,000—say 37,000,000. In the following table are given the stocks at various times in the past.

ESTIMATED TOTAL COMMERCIAL STOCKS OF BITUMINOUS COAL IN THE UNITED STATES (*a*)
(In net tons)

Oct. 1, 1916	27,000,000	Jan. 1, 1919	57,900,000
Oct. 1, 1917	28,100,000	April 1, 1919	40,400,000
July 15, 1918	39,700,000	March 1, 1920	24,000,000
Oct. 1, 1918	59,000,000	June 1, 1920	20,000,000
Day of Armistice	63,000,000		

(*a*) Coal in transit not included.

The following table has been prepared by selecting from the 4,850 reports received, 3,779 plants for which reports were available on each of six dates from Jan. 1, 1919, to April 1, 1921, and tabulating their stocks in tons on each date. The table shows that the 3,779 plants had on hand as

of Jan. 1, 1921, a total of 13,770,000 tons of soft coal. This was 23 per cent less than the tonnage on hand at the same plants on Jan. 1, 1919, just after the armistice. Three months later, on April 1, 1921, the 3,779 identical plants had 11,159,000 tons in storage, a decrease as compared with Jan. 1 of 19 per cent. In terms of total tons in storage these plants were less well off than on April 1, 1919. They were, however, much better protected than on either of the two dates shown for 1920.

The course of stocks of bituminous coal at 3,779 identical plants epitomizes the present condition of consumers' stocks. At the beginning of 1921 consumers' reserves were comfortably large. In the three months which followed they were heavily drawn upon. The quantity remaining on April 1 was less than the abundant stock of early 1919 but much greater than the stock in the period of scarcity of 1920.

STOCKS OF BITUMINOUS COAL IN HANDS OF CERTAIN CONSUMERS AND DEALERS, JAN. 1, 1919, TO APRIL 1, 1921

(In thousands of net tons)

Class	Plants Reporting	Jan. 1, 1919	Apr. 1, 1919	Mar. 1, 1920	June 1, 1920	Jan. 1, 1921	Apr. 1, 1921
Byproduct coke plants	41	2,628	1,541	850	404	1,763	1,340
Steel plants	79	1,646	1,142	444	491	1,028	752
Other industrial plants	2,209	9,109	6,012	3,672	3,252	6,877	5,023
Coal-gas plants	102	756	661	310	212	610	724
Electric utilities	241	2,112	2,013	1,081	1,098	2,068	2,116
Coal dealers	1,107	1,753	1,095	740	530	1,424	1,204
Totals	3,779	18,004	12,464	7,097	5,987	13,770	11,159
Railroads	283	(a)	(a)	(a)	(a)	6,741	6,737

(a) No comparable data.

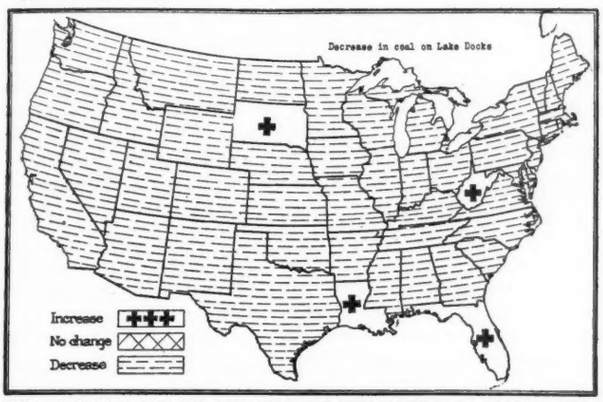


FIG. 2. CHANGES IN STOCKS OF INDUSTRIAL CONSUMERS FROM JAN. 1 TO APRIL 1, 1921

Soft coal at industrial plants other than steel and byproduct. Industrial consumers as a class drew heavily on their reserves in the last quarter of the coal year except in four states. Of the four exceptions, three are industrially unimportant states, and one —West Virginia—is in the heart of the mining region.

Summary of present condition of bituminous stocks.—At the beginning of 1921 consumers' reserves of coal were comfortably large. Since then they have been heavily drawn upon. Up to April 1 the quantity withdrawn had not been great enough to lower the level of stocks to the danger point. On that date the tonnage in storage, though a little less than in the time of abundance of 1919, was much greater than in the period of scarcity of 1920. The draft upon stocks continued into April, however, and probably still continues; and obviously, if it be not soon checked, reserves will fall below the level of safety.

Stocks by Types of Consumers

Industrial Consumers.—Of all classes of consumers the general industrial group, exclusive of the special classes of steel and byproduct coke plants, furnish the best index to changes in stocks. They are therefore made the subject of special analysis in the four accompanying diagrams.

Byproduct and Steel Plants.—The trend of stocks at byproduct coke ovens and steel plants has followed the course of industrial stocks generally (Fig. 1). The byproduct plants in particular illustrate how greatly the size of the stocks necessary for safety is affected by the rate of consumption. Measured in tons, stocks at the plants reporting on April 1, 1921, were midway between the abundance of early 1919 and the scarcity of 1920.

Public Utilities—Unlike the industrial consumers, the public utilities seem to have built up their reserves during the three months from January to March, and to be at present well supplied with coal. Reports were received in time for inclusion in this bulletin from 102 gas and 241 electric plants. Both groups

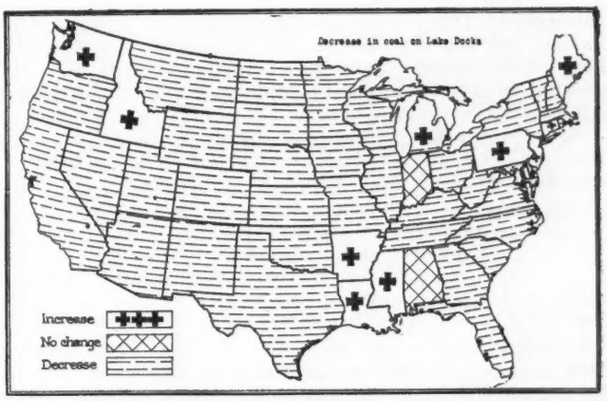


FIG. 3. HOW PRESENT STOCKS COMPARE WITH THOSE AFTER THE WAR

Changes in tons of soft coal on hand at group of identical industrial plants (excluding steel and byproduct) from April 1, 1919, to April 1, 1921. As a result of the great accumulation of coal prior to the armistice, stocks on April 1, 1919, were admittedly high. On the corresponding date this year they were very generally lower.

increased their stocks from Jan. 1 to April 1, largely through deliveries on contracts entered into previously; both have practically as much on hand now as they did in early 1919 and twice as much as in June, 1920.

In comparison with 1920 practically every state showed an improvement, and the Appalachian, Middle Atlantic, New England States, and much of the Lake docks territory recorded increases over even April 1, 1919. Assuming that these preliminary conclusions will be confirmed by later returns, it therefore appears that the public utilities as a class have taken advantage of the present opportunity to get coal easily and quickly and are today in a strong position.

Retail Yards.—Stocks of bituminous coal in the yards of retail coal merchants were greater on April 1, 1921, than on the corresponding date two years ago, and much larger than last year.

Railroad Fuel.—The railroads of the country had about three weeks and five days' supply of coal in cars, stock piles and chutes on April 1. Reports from 283 roads had courteously been assembled by the American Railway Association up to Friday, April 29, and complete returns for all roads are promised. The 283 roads had on hand 6,741,000 tons as of Jan. 1, and almost exactly the same amount—6,737,000 tons—on April 1. This was equivalent to twenty-six days' requirements at the going rate of consumption.

WEEKS' SUPPLY OF BITUMINOUS COAL HELD BY RAILROADS

(Figures represent supply in weeks and days at current rate of consumption at time of stock-taking)

July 1, 1918	3–4	March 1, 1920	*1–4
Oct. 1, 1918	4–1	June 1, 1920	*1–3
Nov. 11, 1918	4–3	Jan. 1, 1921	3–5
Jan. 1, 1919	4–4	April 1, 1921	3–5

* Probably low.

Bituminous Coal in Transit

Lake Docks.—Coal in transit forms a sort of mobile reserve as opposed to the stationary reserve in the bins of

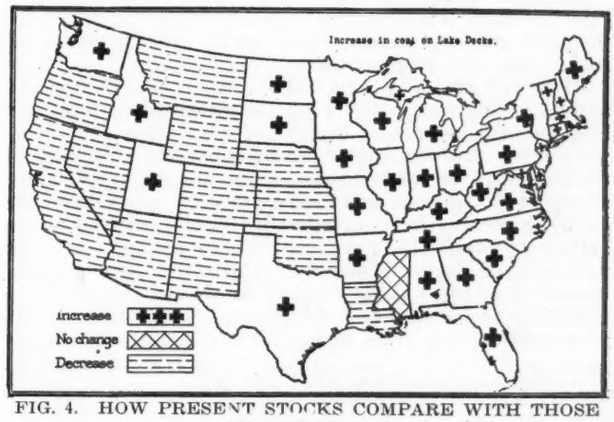


FIG. 4. HOW PRESENT STOCKS COMPARE WITH THOSE OF A YEAR AGO

Changes between June 1, 1920, and April 1, 1921, in tons of soft coal on hand at same group of industrial plants shown in Fig. 3. The low state of stocks in eastern half of the country and in the territory supplied by the docks, reported on June 1, 1920, was an important factor in the high prices of last year. In the territory then feeling scarcity, stocks now are much larger.

consumers. This mobile reserve includes not only the coal in cars but also the coal on the commercial docks at the head of the Lakes. The tonnage on the docks is normally greatest in the fall at close of navigation, and least in the spring when navigation opens.

According to the Northwestern Dock Operators' Association, the carry-over at the beginning of the past four seasons has been:

BITUMINOUS COAL ON HAND AT OPENING OF NAVIGATION AS REPORTED BY 24 DISTRIBUTING DOCK COMPANIES ON LAKE SUPERIOR AND LAKE MICHIGAN

(In net tons)

April 1, 1917	572,687	April 1, 1919	3,374,506
April 1, 1918	1,031,978	April 1, 1920	860,521

Complete returns concerning the carry-over on April 1, 1921, are not yet available, but the total is thought to be at least 2,250,000 tons. The following statement shows the bituminous coal on hand at the opening of navigation, held by companies now reporting to the Northwestern Coal Dock Operators' Association (though incomplete, the figures cover an identical group of companies operating at Duluth, Superior, Ashland and Washburn), in net tons:

1917	387,968	1920	514,902
1918	987,246	1921	1,643,034
1919	2,439,749		

Though smaller than 1919, the 1921 carry-over was thus much larger than in either of the war years, and three times as great as last year.

Coal at Tidewater.—Coal in cars sometimes accumulates in volume at Tidewater piers. How the tonnage has fluctuated in the past two years is suggested by the accompanying statement of the quantity on hand at two of the three piers at Hampton Roads, the country's leading port of export. As in other instances in this report, the figures are samples only (in net tons):

Jan. 1, 1919	138,000	June 1, 1920	234,000
April 1, 1919	198,000	Jan. 1, 1921	199,000
March 1, 1920	138,000	April 1, 1921	296,000

The tonnage on hand April 1, 1921, was nearly 100,000 tons greater than on Jan. 1.

At New England Gateways. — Coal seldom accumulates at the New England rail gateways over the Hudson in volume sufficient to constitute an important item in the mobile reserve. On April 2, for example, the number of cars of soft coal waiting to be forwarded to New England was only 286, equivalent to about 14,000 tons.

Stocks of Pennsylvania Anthracite

Unlike the bituminous industry the anthracite mines continued in active operation during the last quarter of the coal year. January shipments, as reported by the Anthracite Bureau of Information, were large, and those of February established a new record for that month. In March, however, shipments declined slightly.

The facts both as to dealers' and producers' stocks indicate that there is a considerable reserve of anthracite mined, prepared and even shipped well toward destination, ready for all who care to purchase it.

Producers' Stocks of Anthracite.—Steady operation of the anthracite mines at a time when the bituminous mines have been working but two or three days a week has been made possible to some extent by the accommodation of part of the output in the storage yards of the producers. Whereas storage of bituminous coal by the producer is so rare in the United States as to be practically non-existent, the larger anthracite companies have constructed storage yards to receive their excess production in times of low demand. According to the Federal Trade Commission, the stocks of anthracite in the hands of the principal producers were as follows in the five years before the war (in gross tons):

April 1, 1913	3,891,711	April 1, 1916	4,585,906
April 1, 1914	5,223,844	April 1, 1917	894,347
April 1, 1915	7,406,502		

What the total in storage amounts to now is not known, but from the following table, based on reports from seven large companies comprising the bulk of the tonnage, it will be seen that present stocks are smaller than those of 1913-1916 though greater than those of early 1917.

ANTHRACITE IN STORAGE BY SEVEN LARGE PRODUCERS (a)

(In gross tons)

Date	Domestic Sizes Including Pea	Steam Sizes	Total
Jan. 1, 1919	227,197	638,388	866,185
April 1, 1919	907,002	850,879	1,757,881
March 1, 1920	259,617	909,970	1,169,587
June 1, 1920	385,095	576,974	962,069
Jan. 1, 1921	124,354	353,571	477,925
April 1, 1921	371,088	987,888	1,358,976

(a) Includes coal on the Lake docks.

Anthracite in Transit. — The quantity of anthracite in cars at Tidewater on April 1 was about the same as on the corresponding date of recent years.

Anthracite lying on the docks at the head of Lake Superior is properly to be regarded as coal in transit. The quantity on hand April 1 was larger than in 1917 and 1918, but smaller than in 1919 and 1920. The following data, covering most but not all of the dock companies, are published by permission of the Northwest Coal Dock Operators' Association (figures in net tons):

April 1, 1917	8,294	April 1, 1920	103,867
April 1, 1918	3,955	April 1, 1921	83,893
April 1, 1919	134,911		

Retailers' Stocks of Anthracite. — Retail coal merchants appear to have as much or more anthracite on hand as at any time in the past two years. Reports received from 813 representative dealers in anthracite in the twenty-four states where Pennsylvania anthracite is sold in significant amounts showed the following quantities on hand (in net tons):

Jan. 1, 1919	980,000	June 1, 1920	623,000
April 1, 1919	865,000	Jan. 1, 1921	874,000
March 1, 1920	843,000	April 1, 1921	1,323,000

If the situation of these dealers is typical of the trade in general, there was an increase of nearly 50 per cent in the stocks in retailers' yards from Jan. 1 to April 1. The increase was general throughout New England and the Middle Atlantic States, and as far south as Virginia and west as Indiana and Michigan.

In striking contrast to the East, stocks decreased in Illinois, Missouri, Iowa, Nebraska and the territory supplied from the Lake docks. Even in these states, however, the stock in retailers' yards on April 1 averaged from two to six weeks' supply at the rate of delivery prevailing from January to March. For the entire group of 813 merchants the average supply was sufficient for five weeks and one day.

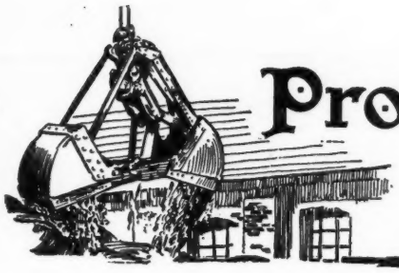
In comparison with either 1919 or 1920, retailers' stocks at present show a very general increase.

Hoover and Cummins to Address National Coal Association Convention

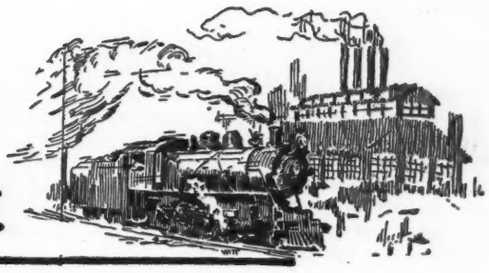
WHILE the program for the annual convention of the National Coal Association has not been completed, the association on May 2 issued the following forecast of the program:

"The program includes Herbert Hoover, Secretary of Commerce, who has some new and practical ideas about trade associations and the extent of the government's relation to business; Senator Cummins, chairman of the Interstate Commerce Committee of the Senate and one of the greatest authorities on transportation in the United States; James A. Emery, counsel of the National Association of Manufacturers and primarily responsible for the splendid growth of that fine organization; A. W. Douglas, vice-president of the Simmons Hardware Co., who can tell us when business will revive and how and why, if any man can; Dr. Stanley L. Krebs, who can give the most experienced coal operators some new and helpful ideas on coal salesmanship, and John J. Cornwell, former Governor of West Virginia, whose experience in that office gives great weight to his views on the proper relationship of the state and the coal industry."

AS COAL AGE GOES TO PRESS it is reported that the indictments for fraud against Charles S. Allen and Gibbs L. Baker, of the Wholesale Coal Trade Association of New York, secured last February by Armin W. Riley, will be dismissed.



Production and the Market



Weekly Review

PRELIMINARY data on stocks of coal in the United States in April, just released by the Geological Survey is not as disquieting as had been anticipated by some. Briefly the figures indicate a drop in total stocks of bituminous coal in the three months from January 1 to April 1 this year, of 8,000,000 net tons, after having climbed 25,000,000 from the 20,000,000-ton mark on June 1, 1920, to 45,000,000 tons total on Jan. 1, 1921.

As production less exports in the months of January, February and March of this year was in round numbers 95,700,000, and stocks were decreased by 8,000,000 tons, consumption was about 103,700,000 net tons, or at an average rate of less than 38,000,000 tons a month, and probably less than 35,000,000 tons in April.

Stocks of bituminous coal on April 1 were therefore more than sufficient for one month's needs, at the present rate of consumption. The reluctance of consumers to purchase coal and the resistance offered to sales arguments of the coal men is thus largely explained.

The conclusion based on the Survey preliminary figures is that the draft on stocks of bituminous coal is not as yet serious, in view of the low rate of consumption. The figures hold out a cheerful prospect in that they forecast a steadily improving market.

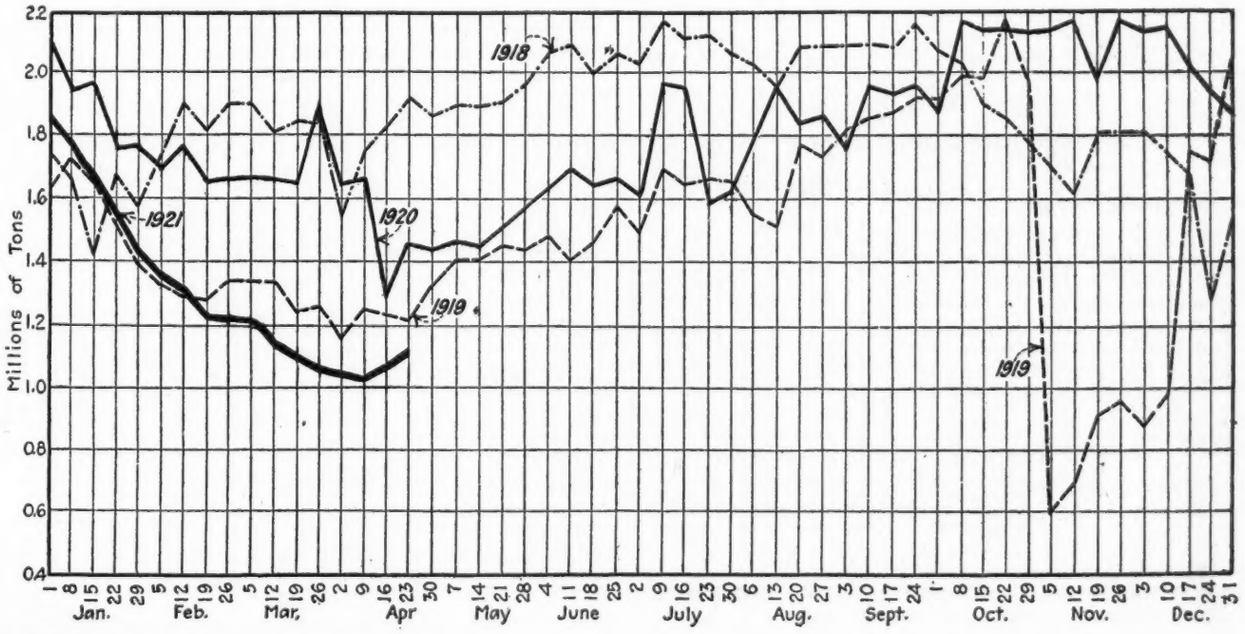
On the contrary, the figures of stocks of anthracite show the country full of hard coal. Consumers are taking it in at a satisfactory rate, producers' storage is accumulating and production is holding well up to the 2,000,000 tons a week mark.

Lake Carriers Give Seasonal Reduction

Apparently with great reluctance the Interstate Commerce Commission last week gave the Lake carriers permission to file tariffs for lower rates in coal to the Lower Lake ports. The new rates are lower than those at present by 28 cents a ton. The permission extends only until October 31 and is therefore in the nature of a seasonal rate. It is expected that this move will give life to the shipment of Lake coal, now lagging. No concern has been felt as yet over the slowness of the Lake movement because of the size of the hold-over stocks at the Head of the Lakes.

Prices gained very slightly, *Coal Age* index going up one point, from 103 to 104 at the beginning of the week. The gain was the result of new circular prices on May 1, in the Middle West. Strangely enough, the stiffening of prices in that territory has increased demand. Buyers who did not buy when prices were at the bottom are in this market as prices are marked up.

Daily Average Production of Bituminous Coal*



*From weekly report of Geological Survey.

BITUMINOUS

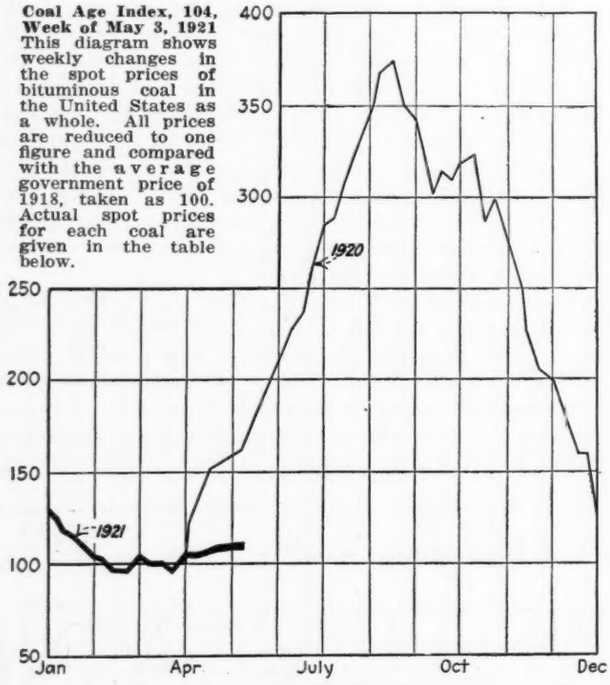
Recovery in rate of production continued during the week ended April 23. The total output is estimated by the Geological Survey at 6,829,000 net tons or 294,000 tons more than during the last preceding week. A further recovery is seen in the heavier loadings for Monday and Tuesday of the next week, April 25-30. Although production is increasing, the total output for April will fall short of consumption, as outlined in the report of stocks of coal on hand April 1, 1921, shown elsewhere in this issue.

The coal market is almost devoid of activity to date. The British strike has brought some trade but only a few cargoes have sailed to apply on English business. Some coal has been shipped on speculation, which means that it will ultimately fall on the British market, but actual orders in hand, accruing from the strike, are few.

Readjustment of discrepancies in the all-rail and rail and water charges to the Northwest is expected to have a bolstering effect on cargo coal business up the Lakes, from Ohio, Pennslyvania, West Virginia, Kentucky and Tennessee fields, as operators believe that the new tariffs will place them on a more favorable competitive basis with Illinois and Indiana producers. Early Lakes charters have just been made, the vessel rate being unchanged from last year. Notices have been posted on the various coal docks in Duluth, Superior and Ashland announcing a further cut in wages of about 8c. an hour for those employees who do not sign before May 1 the wage scale presented by the companies on April 1. Only a small percentage of the workers have maintained their demand that wages and working conditions remain unchanged.

Contracting is progressing very slowly. Some business has been closed for railroad fuel in the Alabama and Kentucky fields but one or two of the larger Middle Western railroads are showing a disinclination to sign contracts, stating their intention, in case of a national necessity, to try to work the old game of preferential car supply.

Coal Age Index, 104, Week of May 3, 1921 This diagram shows weekly changes in the spot prices of bituminous coal in the United States as a whole. All prices are reduced to one figure and compared with the average government price of 1918, taken as 100. Actual spot prices for each coal are given in the table below.



Estimates of Production

FROM THE WEEKLY REPORT OF THE GEOLOGICAL SURVEY

(NET TONS)

BITUMINOUS COAL

Total Bituminous, Including Coal Coked

	1921 Week	1921 Calendar Year to Date	1920 Week	1920 Calendar Year to Date *a*
April 9*b*	6,120,000	108,743,000	9,690,000	145,990,000
Daily average	1,020,000	1,298,000	1,615,000	1,732,000
April 16*b*	6,535,000	115,278,000	7,563,000	153,553,000
Daily average	1,089,000	1,284,000	1,261,000	1,701,000
April 23*c*	6,829,000	122,107,000	8,523,000	162,076,000
Daily average	1,138,000	1,275,000	1,420,000	1,683,000

(*a*) Less 2 days' production during first week in January to equalize number of days covered for the two years. (*b*) Revised from last report. (*c*) Subject to revision.

ANTHRACITE

	1921 Week	1921 Calendar Year to Date	1920 Week	1920 Calendar Year to Date *a*
April 9*b*	1,865,000	24,612,000	1,538,000	23,461,000
April 16	1,885,000	26,497,000	1,249,000	24,710,000
April 23*c*	1,903,000	28,400,000	1,663,000	26,373,000

(*a*) Less 2 days' production during first week in January to equalize number of days covered for the two years. (*b*) Revised from last report. (*c*) Subject to revision.

BEEHIVE COKE

Week Ended Apr. 23 1921 *a*	Apr. 16 1921 *b*	Apr. 24 1920	1921 to Date	1920 to Date *c*
73,000	74,000	341,000	2,774,000	7,015,000

(*a*) Less 2 days' production during first week in January to equalize number of days covered for the two years. (*b*) Revised from last report. (*c*) Subject to revision.

Current Quotations—Spot Prices, Bituminous Coal—Net Tons, F.O.B. Mines

	Market Quoted	Mar. 1920	Apr. 5 1921	Apr. 26 1921	May 3 1921†
Low-Volatile, Eastern					
Pocahontas mine run	Columbus	$2.35	$3.50	$3.35	$3.35
Pocahontas lump	Columbus	2.60	5.50	5.25	**5.25@ 5.50**
Pocahontas mine run	Chicago	2.35	4.15	4.00	3.50@ 4.50
Pocahontas lump	Chicago	2.60	5.15	5.00	4.50@ 5.50
*Smokeless mine run	Boston	....	5.85	5.75	**5.85@ 6.15**
Clearfield mine run	Boston	2.95	2.45	2.20	**2.00@ 2.65**
Somerset mine run	Boston	2.95	3.05	2.80	**2.25@ 3.60**
Pool 1	New York	2.95	3.40	3.50	**3.50@ 3.75**
Pool 1	Philadelphia	2.95	3.50	3.40	3.25@ 3.50
Pool 1	Baltimore	2.95	3.15	3.10	**3.10@ 3.25**
Pool 9	New York	2.95	2.80	2.75	*2.60@ 2.75*
Pool 9	Philadelphia	2.95	3.05	3.05	*2.80@ 2.90*
Pool 9	Baltimore	2.95	2.90	2.95	2.90@ 3.00
Pool 10	New York	2.95	2.45	2.55	2.35@ 2.75
Pool 10	Philadelphia	2.95	2.65	2.75	*2.50@ 2.75*
Pool 10	Baltimore	2.95	....	2.45	2.40@ 2.50
Pool 11	New York	2.95	2.15	2.20	*1.90@ 2.25*
Pool 11	Philadelphia	2.95	2.00	2.45	*2.25@ 2.50*
Pool 11	Baltimore	2.95	....	2.30	2.25@ 2.35
Pool 71	New York	2.95	3.15	2.95	*2.65@ 3.00*
Pool 71	Philadelphia	2.95	3.00	3.30	*3.00*
Pool 71	Baltimore	2.95	....	3.00	*2.90@ 3.00*
High-Volatile, Eastern					
Pool 34 (54-64)	New York	2.50	2.00	2.00	**2.00@ 2.25**
Pool 34 (54-64)	Philadelphia	2.50	2.15	2.15	*1.90@ 2.00*
Pool 34 (54-64)	Baltimore	2.50	2.05	2.15	*2.00@ 2.15*
Pittsburgh mine run	Pittsburgh	2.35	2.25	2.25	2.25
Pittsburgh sc'd gas	Pittsburgh	2.35	2.85	2.85	2.85
Kanawha mine run	Columbus	2.70	2.35	2.25	*2.00*
Kanawha lump	Columbus	$2.95	$3.35	$3.50	*$3.25*
Hocking mine run	Columbus	2.50	2.25	2.20	*2.00*
Hocking lump	Columbus	2.75	3.25	3.35	*3.00@ 3.15*
Pitts. No. 8 mine run	Cleveland	2.35	2.25	2.20	2.15@ 2.25
Pitts. No. 8 lump	Cleveland	2.60	3.45	3.40	*3.10@ 3.40*
Midwest					
Franklin, Ill., mine run	Chicago	2.35	3.40	3.40	3.25@ 3.50
Franklin, Ill., lump	Chicago	2.55	3.55	3.55	**3.65@ 3.85**
Central Ill., mine run	Chicago	2.35	2.25	2.75	**2.75@ 3.15**
Central Ill., lump	Chicago	2.55	2.85	3.00	**3.00@ 3.50**
Ind. 4th Vein mine run	Chicago	2.35	2.65	2.75	**3.00@ 3.50**
Ind. 4th Vein lump	Chicago	2.55	3.15	3.25	**3.25@ 3.75**
Ind. 5th Vein mine run	Chicago	2.35	2.50	2.75	**2.85@ 3.00**
Ind. 5th Vein lump	Chicago	2.55	2.75	3.00	**3.15@ 3.40**
Standard mine run	St. Louis	2.35	1.95	1.80	1.75@ 1.85
Standard lump	St. Louis	2.55	2.40	2.40	2.25@ 2.50
West Ky. mine run	Louisville	2.35	2.40	2.25	*2.10*
West Ky. lump	Louisville	2.60	3.05	3.00	*2.60*
South and Southwest					
Big Seam mine run	Birmingham	2.45	2.85	2.95	2.85@ 3.10
Big Seam lump	Birmingham	2.75	3.15	3.60	**3.40@ 4.00**
S.E. Ky. mine run	Louisville	3.00	2.70	2.75	*2.50@ 2.85*
S.E. Ky. lump	Louisville	3.25	3.55	3.75	3.50@ 4.00
Kansas mine run	Kansas City	3.50	4.40	4.40	4.25@ 4.50
Kansas lump	Kansas City	4.00	5.50	5.00	5.00

* Gross tons, f.o.b. vessel, Hampton Roads. Quotations on Pocahontas mine run, Boston market, heretofore quoted included both Pocahontas and New River and will henceforth be quoted as West Virginia "Smokeless."

† Advance over previous week shown in **heavy type**, declines in *italics*.

Publicity given rumors of sweeping reductions in freight rates also has an unfavorable reaction upon buying. New England continues indifferent and competition among shippers to sell is as keen as ever. Receipts are low in all quarters and few can see any activity for a good many weeks to come. New York and Philadelphia market prices remain practically unchanged but a better tone is apparent. Undoubtedly freight rates will decrease but as soon as they do those buyers who have been holding off will rush in and place orders, with the natural result of boosting the market. The wise man is purchasing his coal now as any decrease in freight will be more than wiped out by the increased prices of coal after the new rates go into effect.

ANTHRACITE

Production for the week ended April 23 was 1,903,000 net tons, some 20,000 tons in excess of the output for the second week in April. Considerable more activity has been reported, some of which may be attributed to the campaign being conducted urging the early buying of domestic sizes. Stove coal is in the heaviest demand while pea coal is hard to move.

Independents are maintaining their prices at 10 to 30c. above company schedule. The latter were raised May 1, as anticipated. The increase amounts to 10c. on domestic sizes up to 25c. on stove, steam prices being unchanged. April shipments to New England proved to be smaller than expected. A dull spell is predicted for mid-summer in this section but deliveries will have to improve very materially during the early summer if there is to be any lack of orders later on.

COKE

Very little change marked beehive production during the week ended April 23. The total output was 73,000 net tons, only 1,000 tons less than during the preceding week. Connellsville prices show a wide range and the market outlook seems improved.

Lake Coal Dumped Season to May 1

NET TONS

	1917	1918	1919	1920	1921
Total	651,000	891,000	1,113,000	329,000	1,176,000

Reports From the Market Centers

New England

BOSTON

No Real Improvement — Distributors Watch Lake Movement — Light Volume to Tide — Smokeless Responds Slightly to British Situation—Anthracite Tightens.

Bituminous—The beginning of May shows little sign of better industrial conditions. Buyers continue indifferent and there is the same keen competition among shippers that has been characteristic since January. A certain number of spot sales have been made on offers, but in nearly every case the purchaser is reluctant and queries whether it would not have been better to wait.

Operators who have contracts effective from April 1 and May 1 realize they are far short of the consignments necessary to run more than two days per week and consumption is at so low an ebb that many steam users find themselves no nearer the spot market than in February, full contract quotas having come forward where permitted during all three of the last months in the old coal year.

Publicity given rumors of lower rail freights also has an unfavorable reaction upon buying. At the same time, should the reduction be accomplished the trade here has doubts whether before August it would very much accelerate movements to New England. Receipts are low in all quarters, and few can see any activity for a good many weeks to come. Even then, the recovery will be very gradual and at reasonably stable prices, for it it is difficult now to imagine the possibility of any runaway market. Credits and other conditions are entirely too restrictive to permit this.

Lower rates from West Virginia to the Lakes may give an impetus to trade in that direction and movement will be watched closely for its bearing upon other markets. Meanwhile the volume of steam coals flowing to Tidewater shows no appreciable increase.

Pocahontas and New River dumpings remain about on a 30 per cent basis. Since last week the smokeless coals have reacted slightly to inquiries offshore, and it is understood several additional cargoes have been placed with British interests at points ordinarily served from English ports. Certain agencies have withdrawn quotations of $5.50@5.75 per gross ton f.o.b. Norfolk and Newport News, but doubtless this is due to unexpected sales abroad. The trade feels there has as yet developed no buying power sufficient to mark up prices more than for the time being.

Anthracite—There is every appearance of stove size being somewhat jammed. April shipments proved most disappointing to New England, although early in the month inquiry was almost the lightest for years. Egg as well as stove is now in good request and dealers dependent upon barge movements, especially from Philadelphia, are apprehensive. A dull spell is still being predicted for mid-summer, based very largely upon the lack of ready money in the hands of ultimate consumers, but deliveries will have to improve very materially during May and June if there is to be any lack of orders in July.

Retail buying is spotty, but in most cities in this territory a good spring tonnage is being moved to the cellars.

Tidewater—East

NEW YORK

Anthracite Prices Advance — Domestic Demand Is Strong—Steam Coals Drag — Bituminous Shows Slight Improvement—Many Inquiries for Export.

Anthracite—There is no sign of a let-up in demand. All domestic coals move readily but there is a slower movement of steam. Operators entered the month of May with enough business on the books to insure an active four weeks.

As was expected, the large operators increased their mine prices on May 1. Some advanced the usual 10c. on all domestic including pea, others added 10c. to these sizes with the exception of 15c. on stove. Others added 25c. to the price of various domestic coals.

Independent coals are finding a ready market. The larger sizes, with the exception of pea, are well sold ahead. In some instances it has been necessary to offer concessions to move chestnut. The better independent grades are bringing an average of about 50c. over the company schedules, while pea is $5.25@$5.75, according to quality.

The demand for steam coals has not been quite as strong. Some independent buckwheat has moved at slight concessions below the company schedule while some of the better grades have brought 25c. more.

Current quotations for company coals per gross ton, at mine and f.o.b. Tidewater, lower ports, follow:

	Mine	Tidewater
Broken	$7.20@$7.75	$ 9.81@$10.36
Egg	7.20@ 7.75	9.81@ 10.36
Stove	7.50@ 8.10	10.11@ 10.71
Chestnut	7.50@ 8.10	10.11@ 10.71
Pea	5.75@ 6.15	8.22@ 8.62
Buckwheat No. 1	$3.50	$5.97
Rice	2.50	4.97
Barley	1.50	3.97
Birdseye	2.50	5.02

Bituminous—Some of the more active houses say conditions are about the same as they were four weeks ago. Demand cannot be said to be stronger. Indications however, point to a more

active market shortly. In fact, it is believed the market would be stronger today but for the belief that there is to be a cut in freight rates. This report has been current for the past week and consumers do not hesitate to say they will not place new orders until the report is definitely settled.

Local houses are receiving many inquiries for export on account of the British labor troubles but there has been little actual business closed. In some instances pool coal is entirely eliminated in the consideration of the business, individual grades alone being considered.

There has been no change in the contract situation. Buyers are watching the spot market closely. Tidewater quotations range about as follows: Pool 9, $6.15@$6.30; Pool 10, $5.80@$6; Pool 71, $6.25@$6.35, and Pool 11, $5.30@$5.60. Mine quotations are reported in the Weekly Review.

BUFFALO

Quiet Is Still the Word—Waiting for Wage and Freight Adjustment — Anthracite Fairly Active — Lake Loading Good.

Bituminous—Some shippers express suspicion of a certain class of contracts that are coming out at ridiculously low prices, some as low as $2.46 being reported. They are made by certain mine owners who are noted for not holding to an agreement when it is convenient not to do so. This business looks well on the books, but it is not believed that they will hold when the pinch comes.

A cautious shipper does not like to make a year's contract for less than $3 and often is so situated that he cannot afford to stop very near that mark. It seems to have been the operators with fair contracts that they kept up the year through, who came out best at the end of the last coal year, and they are willing to enter on more of the same sort, but, as a rule, the consumer refuses anything that has profit in it for the shipper, so nothing is being done.

With no real contract basis yet, the spot price still runs about $3.50 for Youghiogheny gas lump, $3 for Pittsburgh and No. 8 steam lump, $2.60 for all mine run and $2.25 for slack. The making of so little lump has produced something of a scarcity of slack and the price has come up a little.

Anthracite—The demand ran up somewhat at the end of the month. But it has not been as good as it should be, if there is to be no shortage next fall. The independent mines find it hard to keep going and some are shut down.

Lake trade is still pretty brisk, but so much is now afloat that shippers are not anxious for tonnage. Many cargoes are now cleared, but only a few have gone out, as the coal is loaded at vessel-owners' option and they will not sail unless there is a return cargo.

Clearances for the week totaled 118,561 net tons, being 51,961 tons for Chicago, 26,800 tons for Milwaukee, 30,300 tons for Duluth and Superior and 9,500 tons for Fort William. A single bituminous charter, Ohio ports to Duluth at 50c. for the season, is all that is yet reported.

PHILADELPHIA

Anthracite Prices Increase—Better Retail Buying—Stove in Strong Demand —Tax Act Awaits Signature — Bituminous Holds Own — Contracts Unchanged—Trade Grows Hopeful.

Anthracite—While all the producing companies have not at this writing announced their May schedules, the leading company came out with an advance of 10c. on broken, egg, nut and pea, with an extra 5c. on stove. It was rather expected that stove would receive a heavier advance, as the demand during the past two weeks had risen to a point where it was all out of proportion to the tonnage produced, although it will take a much heavier increase than this to remove any of the pressure from the consumer. Some independents have increased this size 15c.@20c. Steam sizes have not been increased.

If anything, the retail prices have been more stable around $13.75 for stove and nut, but there is still much quiet shading. So far the trade has not added anything to the selling price on account of the increase in mine prices, but they will not quote beyond immediate delivery. It is likely that the retail prices will not be changed until the Governor signs the tax act adding 1½ per cent to the mine price—about 12c. a ton. With this added to the mine increase, it will mean about 25c. additional on the retail prices.

Stocks have become much reduced, and with the exception of pea, many are down to the boards. Dealers have more orders for stove than they will be able to fill. Lately there seems to be a tendency on the part of the dealers to complain of the excessive amount of small sizes in nut and this may explain the somewhat better condition of pea.

Steam coals are possibly in little better demand, and not much free buckwheat is on the market under $3.25. It appears that some of the ordinarily large users of this size are beginning to store.

Company mine prices per gross ton and f.o.b. Port Richmond for Tide are as follows:

	Mine	Tide
Broken	$7.35	$10.05
Egg	7.35	10.05
Stove	7.70	10.35
Nut	7.65	10.30
Pea	6.00	8.40
Buckwheat	3.50	6.00
Rice	2.50	5.00
Boiler	2.00	4.40
Barley	1.50	3.90

Bituminous—Business about holds its own, there are even instances where shippers claim there is a bettering of conditions, and we know of at least one good-sized concern who had five full days work recently. This is one of the best coals mined, and the present market is mostly concerned with the best grades. Even though no general improvement is reported there seems to be something of cheerfulness pervading the trade as it looks to the future. There has been some slight resumption in the iron trades and this is encouraging as they take by far the larger share of production.

The stronger houses cling closely to the contract quotations made earlier in the season and while the consumer, in many instances, is inclined to sneer at a figure around $4 when he can get good coal on the market for one-third less, there is little inclination recently to shade prices. Spot prices vary little, and are shown in the Weekly Review.

HAMPTON ROADS

Business Increases — Some Speculative Cargoes — Prices Firm Up — Seamen's Strike Affects Contracts.

Indications that Great Britain has already felt the pinch of the strike of coal miners were given this week when two American steamers loaded cargoes for Ireland. During one day this week, six coal cargoes, aggregating 37,770 tons, sailed from Hampton Roads, all of them for foreign ports except one to Cristobal. This establishes a record for one day's sailings during the last six months.

A number of cargoes have also sailed for Gibraltar, for orders, which is taken to mean that they will ultimately find their way to British vessels or for other purposes. Some of this coal is being sold before shipment, while other cargoes are forwarded on a speculative basis.

Prices remain at approximately $6.25 for Pools 1 and 2, and $5.25@$5.50 for other pools. Accumulations at Tide have decreased. Some cargoes are being contracted for dependent upon the strike of American merchant seamen, the proviso being made that cargoes will be delivered within a certain period if the strike is not of long duration.

Activities at the piers during the week ended April 28, as represented statistically, were as follows:

C. & O. piers, Newport News—	
Cars on hand	2,280
Tons on hand	113,660
Cars dumped April 1 to 27, incl.	5,406
Tons dumped, same period	300,396
Tonnage waiting	3,570
Virginian Ry., Sewalls Point—	
Cars on hand	1,333
Tons on hand	66,650
Cars dumped April 1 to 27, incl.	7,201
Tons dumped, same period	360,819
Tonnage waiting	50,700
Cars on hand outside pools	269
N. & W. Ry., Lamberts Point—	
Cars on hand	1,698
Tons on hand	81,542
Cars dumped April 1 to 27, incl.	5,900
Tons dumped, same period	427,078
Tonnage waiting	22,590

BALTIMORE

Slow Home Market—Prices About on Even Keel — More Activity for Bunkers and Cargo—Hard Coal Men Have New Problem.

Bituminous—A look over the home conditions for soft coal discloses no material change. There is a slight slump from a recent bit of a spurt which seemed to promise better prices. Keen competition exists on all classes of sales in the spot or short-time delivery market, while the contract mar-

ket remains almost dead. Gas and steam coals of better grade are now nearly on a level as to price.

The export movement is increasing, although far from heavy, and more activity is noted at the piers. The desirability of the bunkerage business to many coal men has led to some price-cutting and this end of the trading is less firm than is line business. The light amount running daily on the railroads and the increased dumpings at the piers has cut down the pool reserve to some extent.

Anthracite—Dealers thought they had about all the problems possible for this season in the slowness of the public to order and the question of a retail price adjustment. Now along comes a concern, operating in several Eastern cities, with an offer by advertisement in the daily press, of coal at a price per ton more than $2 below the retail figures here. The advertisement does not explain that this is a net ton, while local dealers sell by law on a gross ton basis; nor that each purchaser must take a $10 share of stock for each $3 secured, adding $3.33 a ton to the cost of the coal—with a share of stock (whatever that may be) thrown into the bargain. All the above would not interest the coal merchants here if it were not for the fact that there is a constant call for information from consumers as to why "you can not sell coal as cheaply as it is advertised in the paper." Meanwhile the new problem only aids in causing delay in ordering.

Northwest

MINNEAPOLIS

Buy-Early Warning Not Taking Hold —Receipts Are at a Minimum—Tardy Lakes Season.

It seems to be a case of being "all out of step but Jim" in the coal trade, for the Northwest is said to be the only section of the territory which is not taking hold with an intention of stocking up a little for future needs. Despite the efforts to urge early coal buying, the situation is just the reverse. There is less buying of coal in the Northwest today than for several years.

To analyze the cause reveals that it is quite a natural outcome of conditions. People of the Northwest are very much of the opinion that the coal trade has profiteered at the expense of the consumer. They are not usually well enough informed to place the blame for the situation upon anyone in particular, and so assess the blame broadcast upon all members.

They have reiteration of possible reductions, to support their hopes of lower prices. Only this week, there was published in the daily press a statement that railroad officials were likely to grant a lower freight rate on coal for the summer months. It is to be hoped that this may prove true, and that it may mature right speedily. It would be a real contribution toward solving the problem. The shortage warning has been worked in the Northwest with varying success for many years, until it has become frazzled and worn. Only last year it was used with thrilling effect, because it was not possible to get coal as required, no matter how much the consumers and others placed their orders. The great and inattentive public forgets the circumstances, but remembers the facts, and when urged to buy early, simply recalls that last year the "buy early" demand was urged when it was not needed.

There is very little hard coal being received—almost none over the docks, but there is some that comes all-rail. It is hardly needed, so far as early buying at retail is concerned. The third week of April saw about ten vessels arrive at the docks at Duluth and Superior, with 80,000 tons of coal. This is larger than the receipts of a year ago, when the coal movement hardly started.

DULUTH

Large Fleet Expected—Contract Activity—Screenings Are Heavy.

Cargoes are now arriving daily and it is expected that a large fleet of coal boats will be received immediately after May 1. Contract business is now being placed, but shipments will not begin until probably late in the summer. Bituminous dock coal is being sold on a very narrow margin.

Most of the docks have individual signatures of their men covering wages and working conditions during the ensuing year, beginning May 1.

The iron mines are reluctant about starting operations because the outlook for ore is not very favorable. This has a tendency to hold back shipments of coal for their account. There has been a little pick-up in commercial business during the past week on all of the docks. There is a large accumulation of screenings on all of the docks and it does not look as though any relief will be found, because Illinois screenings are being sold in the Twin Cities at considerably less than dock screenings can be moved.

MILWAUKEE

Coal Market Dull—Dock Yards Busy Receiving Cargoes—Proposed Regulation of Coal Quality.

Demand is light and will continue so until a definite price schedule has been promulgated. The industrial situation has not improved to an extent appreciable in the demand for fuel.

Dock yards have been kept fairly busy. Thirteen cargoes have been unloaded and several more are on the way. The receipts thus far include 9,000 tons of anthracite and 109,944 tons of soft coal.

A bill has been introduced in the state legislature to compel dealers in Wisconsin to supply their customers with a sales slip covering every load delivered, such slip to bear a statement of the number of heat units contained in the coal, within 200, and the amount of ash within 2 per cent, also whether or not the coal has been screened. The bill reflects a protest against the poor quality of anthracite since war conditions scrambled the coal trade.

Inland West

COLUMBUS

Slight Depressing Reaction Has Taken Place — Buying Is Reduced — Lake Trade Slow in Opening.

The better feeling which had developed recently is disappearing and quiet has settled over the market. All grades are becoming a drug and there is considerable distress coal.

Lake trade is slow in opening because of unsettled prices, bad dock conditions and the slack demand for ore. Loading of bottoms is going on rather actively by producers who have their own dock connections.

Figures quoted for Hocking and Pomeroy ¼-in. lump are $3 and for ¾-in. $3.25. But shippers are still holding off and producers are not very anxious to close contracts because of the uncertainty of the slack situation.

Domestic trade is extremely slow. Householders are showing no inclination to stock up. Some few dealers are taking advantage of the extreme low prices and are stocking up for the summer rush, but this number is very limited. Retail prices are rather steady at former levels.

Steam business is showing slight signs of awakening but demand is still at a low ebb. Only a few public institutions are in the market for their supply for next winter. Public utilities are buying from hand to mouth in the hope of lower prices on screenings when the Lake season is under way.

CLEVELAND

Rate Adjustment Expected to Stimulate Coal Movement—Railroads Closing for Coal Needs — Lake Vessel Rates Fixed.

Bituminous—A distinct feeling prevails that the readjustment of freight rates will speed up the movement from mines in this district. Efforts of operators have been aimed at obtaining a proportional readjustment of rates from the mines in Ohio, Pennsylvania, West Virginia, Kentucky and Tennessee to Lower Lakes docks. Roads serving the Lake Erie ports recently made application for permission to reduce rates 28c. on soft coal carried to the ports for transshipment by vessel. By this means it was hoped to stimulate coal movements and preclude a coal shortage in the Northwest as well as a break down in transportation facilities due to congestion.

Operators believe that the new tariffs will place them on a more favorable competitive basis with Illinois coal producers.

Production at Ohio mines in the last

week slumped somewhat, due to the holding back of shipments to the Lakes in anticipation of the freight revision. Some cases of car shortages are reported due to sidetracking of loaded cars at the ports, which are not dumped because of lack of vessel tonnage. A favorable development in the market has been the covering of fuel requirements by railroads.

Lake—The past few days have seen the first chartering of the season in the coal trade. Contracts for movement of 500,000 tons to docks at the head of Lake Superior have been made by one large local steamship line at a rate of 50c. a ton. Fuel aboard ship will be provided by the shippers at $5.50 a ton based on present rail rates. The vessel rate is unchanged from last year. The fuel price is lower, however, than those charged by other shippers recently. The fact that ore movement will be slow, threatening to compel coal vessels to come down light, is causing steamship operators to keep prices up. Another contract for movement of 150,000 tons to Milwaukee has been placed at 65c. Prompt cargoes are being offered generously.

Pocahontas and Anthracite—Receipts of bituminous coal for the week ended April 23 amounted to 852 cars; industrial 604, retail 248, as compared with a total of 859 cars the preceding week.

Retail prices of coal delivered in Cleveland follow:

Anthracite—Egg and grate, $13.75; chestnut, $13.90; stove, $13.95.
Pocahontas—Shoveled lump, $11; mine run, $9.50.
Domestic Bituminous — West Virginia splint, $10; No. 8 Pittsburgh, $8.15; cannel $12.15.
Steam Coal — No. 6 and No. 8 slack, $5.75; No. 6 and No. 8 mine run, $6; No. 8 ¾-in. lump, $6.

CHICAGO

Conditions Are Unimproved—Railroads Favor Spot Market — Operators Meet to Oppose Preferential Car Supply.

City conditions remain uniformly unsatisfactory. Retailers are buying in a hand-to-mouth way if at all, and factories in operation are cleaning up their storage bins.

One or two of the larger railroads have decided to make no contracts for the time being. Purchasing agents figure that they will be able to buy on the open market and save money for the railroads. The railroads have a number of operators at a great disadvantage as there are many coal producing companies in Chicago who for years have made a specialty of railroad coal and who up until recently have contracted to the railroads. When some of the roads showed a disinclination to sign contracts in the spring, these mines found they were forced to close down as they had no sales organization with which to market their coal.

It has been called to the attention of the railroads that they are taking quite a chance, as it may happen when they come into the market that they will find coal hard to buy and will not be able to purchase on contract as cheaply as they can contract for it today. The answer to this probability is that in case of a national necessity, the railroads will try to work their old game of preferential car supply on railroad fuel orders.

There was a meeting a few days ago in Chicago, attended by operators from West Virginia, Kentucky, Indiana, Illinois, Ohio and Iowa. This meeting was held to determine what stand the operators wished to take relative to such preferential car supply. As a unit, the operators looked upon this with high disfavor.

At this meeting it developed that some of the higher officials of the National Coal Association were in favor of continuing the system for mines with railroad orders but the consensus of opinion of the operators represented at this meeting bitterly opposed the stand of these officials. The general opinion is that the railroads are entitled to no more consideration than a public utility.

ST. LOUIS

Some Activity in Domestic—Public Is Slowly Awakening—Steam Is Easy and Prices Falling.

Considerable improvement is shown in the local domestic situation caused by newspaper advertisements, setting forth the exact conditions. There is a good demand for Carterville for storage. Operating time is improving. The only obstacle to a good movement is the failure to move steam sizes. On May 1 prices on Carterville advanced retail from $7.25 to $7.50. Demand for Mt. Olive is considerably easier, but there is some moving locally. This price also advanced to $6.75.

Standard is slow, very little being put in for domestic and prices are up and down from day to day. The steam call is unusually light. Many mines are blocked out on egg, nut and screenings.

Country call on Carterville is picking up slowly. There is a good movement in the country on Mt. Olive north and west, with scattered shipments of Standard to smaller points inland, but nothing in any volume. Standard probably will not advance locally in retail above the present price of $5.50. There is no advance on coke.

CINCINNATI

Domestic Smokeless Strengthens—Talk of Freight Reductions Retards Trading —Retail Prices Cut.

A decided strengthening of the smokeless domestic market is the outstanding feature this week, traceable to buying orders which have been coming in steadily from inland points. Prices have stiffened so that 25@50c. can be had over the $5 price that had been set. Deliveries for May are being held in most of the offices at $5.50. Mine run has been strongly held at $3.50 for the past three days, and nut and slack has not shown the usual weakness.

The talk of a reduction in freight rates has an irritating effect and holds back those with disposition to contract for their supply. West Virginia interests, which have held aloof from price cutting, entered the market this week with reductions and this had a tendency to lower some of the prices.

Nut and slack, which had been fairly strong for several weeks, dropped to $1.75@$1.90; mine run sold $1.90@$2.10, while the little better inquiry for domestic bolstered the lump price up to $3.50. Prices quoted on contract coal remain relatively the same.

Retail prices have been cut in the effort to tempt householders to buy. Old line companies are quoting bituminous lump $7@$7.50; mine run $6.50@$7, and nut and slack $5.75@$6. Some of the river corporations and others have reduced these prices 25@50c. Another cut of 50c. has been made on smokeless deliveries of mine run, the spread being now $8@$9. Lump, which had a fixed price of $10 for several weeks, also has suffered a half-dollar cut.

DETROIT

Buyers Display Little Interest — Shipments Continue Light—Little Free Coal Found on Tracks.

With buyers holding back and only a small amount of coal coming to Detroit, wholesalers and jobbers are forecasting the development of a situation which will be troublesome to both consumers and dealers. Many of the large users seem to be relying on reserves to provide for their requirements, which are at present considerably below normal. Jobbers believe that when storage stocks have been consumed an unsettled market with rising prices will be the outcome of this policy.

Procrastination in buying is likely to lead to a rush of orders at a time when the steam plants will find there is an active demand for coal for New England, for Lake trade, and perhaps for the export market as well. Transportation conditions, too, are likely to become less favorable.

Smokeless lump is quoted $5 at the mines. mine run is $3.50, and nut, pea and slack is $2. Little distinction is made in quotations on West Virginia, Ohio or Kentucky products; 3-in. lump is $3.40, 2-in. $3.25, 1¼-in. $3.15, ¾-in. $3.05, mine run $2.50 and slack $2. These prices do not always apply on spot sales, however.

South

LOUISVILLE

Prices Well Maintained, but Market Is Sluggish — Movement Not Improving Very Rapidly—Southeastern Kentucky Conditions Improve.

No material improvement in movement is anticipated before June or July. This may throw a big demand into the fall months, resulting in short car

supply. Agitation for early buying is having very little effect.

Some manufacturers in conferences have held that conditions point to higher prices, but they are afraid that they may not get deliveries on contracts, and cannot afford to buy and place the coal on their yards, for the lack of necessary capital to carry it.

There is much surprise over the fact that the L. & N. R.R. paid as high as $3.15 a ton on contract, for eastern Kentucky 4-in. and under mine run. Contract prices show some Harlan mine run quoted as high as $3.50 with screenings, $2.75; Hazard mine run, $3.25; screenings, $2.50; Elkhorn, mine run, $3.50; screenings, $3; western Kentucky mine run, $2.75@$3; screenings, $2@$2.50. Spot prices are shown in the Weekly Review.

BIRMINGHAM

Steam Market Very Dull—Fair Domestic Demand—Supply Is Limited—Railroad Contracts Closed.

There is little steam inquiry in the local market and the tonnage moving over and above contract business is comparatively light. Sales continue to be confined to what is needed to meet current requirements of consumers who have no contract agreements. Practically no contract business is being offered, the only negotiations so far of importance being with the Frisco and L. & N. railroads. The Frisco closed for the year beginning April 1 at $2.75 for Big Seam mine run and $3.15 and $3.25 for Carbon Hill mine run and washed, respectively. The L. & N. contracted at $3.95 for its supply of Cahaba washed, but has not closed for other grades on which proposals were submitted.

There is a fairly good market for all the domestic coal now being produced and practically all the better grades have been sold up through September, and more business could be booked if there was any certainty when the coal would be available at the mines. Quotations for May are as follows per net ton mines; for lump and nut:

Carbon Hill	$3.70@$3.85
Cahaba and Black Creek	4.60@ 5.15
Big Seam	3.40@ 4.00
Montevallo	6.65

West

DENVER

Rates Uncertainty Is Cleared—Prices Stiffen—Production Falls.

Operators expect a gradual stiffening in sales during May. The uncertainty of freight rates has been cleared in a statement from railroads: "While the carriers recognize the necessity of making some realignment of the coal rates in the direction of restoring previously existing relationships as between groups of origin, no general reduction in the rate level is contemplated."

Production for the week ended April 16 was 133,000 tons of a possible 252,000, and 10,000 tons less than the previous week. The statement coming from the carriers is believed to have ironed out the surface troubles.

Prices of bituminous, with the exception of Victor-American and perhaps one or two other companies, will remain at the April base, the mine price of the others calling for an advance of 10c. to $5.75. However, the price is not being strictly adhered to, in view of the fact that the C. F. & I. Co. is selling at $5.50.

Southwest

KANSAS CITY

Domestic Buying Picking Up—Summer Quotations Stiffen—Trade Hampered by Freight Reduction Talk.

There is little buying of domestic grades and it is expected that by the middle of May retail dealers will begin filling up their yards. Buying would have been much heavier at this time had not the rumor gotten out that there was a chance for reduction in freight rates. Consumers and dealers are now convinced that there cannot be a further reduction in prices this year. Some advances have been made on certain grades effective June 10. Arkansas smokeless lump is $6.25 for May shipment. Operators refrain from taking future orders, knowing that later there will be a rush for this grade of coal. Kansas lump and nut is $5, mine run $4.25@$4.50, mill $4, slack $3.75; north Missouri lump is $4.50, mine run $4, and washed slack $4.05.

Canada

TORONTO

Consumers Urged to Stock Up Early—Coal Coming Forward Freely—Soft Coal Little in Demand.

There is practically no change in market conditions. Spring orders are coming in but not in such volume as dealers would like to see. Yards are well stocked and anthracite is coming forward in larger quantities than it is likely to do when navigation has fairly started and a large proportion of the supply is diverted to the Upper Lakes. Industrial conditions do not afford much hope for improvement in the near future. Quotations are as follows:

Retail:	
Anthracite, egg, stove, nut and grate	$15.50
Pea	14.00
Bituminous steam	11.25@11.75
Domestic lump	12.50
Cannel	16.00
Wholesale f.o.b. cars at destination:	
¾-in. lump	8.00@9.00
Slack	6.50@7.00

News From the Coal Fields

Northern Appalachian

ANTHRACITE

Demand Picking Up — Independent Prices Holding — Production Increases.

Production during the last week of April will probably show a decline as ten collieries in the Wilkes Barre district were shut down for several days on account of water trouble when a large water main burst.

The demand appears to be picking up somewhat and this is reflected in a higher rate of production, although the number of independent operations closed remains about the same. The output for the week ended April 23 was 1,903,000 net tons.

PITTSBURGH

Freight Rate Revision May Restore Lake Business—Market Not Materially Changed — Contracts Not Sought by Operators.

For some time prior to last week's announcement it had been known that the Interstate Commerce Commission was disposed to approve of a reduction of 28c. in the rail rate on Lake coal. The local and bunker rate will remain at $2.05½ from the Pittsburgh district, while the cargo rate will be reduced from $1.86 to $1.58. Just now business is practically blocked by the fact that few boats are moving since they do not have ore business.

The coal market is not materially changed. Demand continues extremely light and prices are not well settled. Against the limited demand that appears, some coal from adjacent fields is being offered at less than $2 for steam mine run and this keeps Pittsburgh from selling much above that figure except when the consumer is particular about grade. Gas coal is rather strongly held.

Very little contract business has yet been done, there being little demand, while many operators have refrained from seeking this business, feeling that such contracts would be of little advantage now while they might prove disadvantageous later when there is heavier demand. Operations continue well under 40 per cent.

The spot market is poorly defined but is represented generally by prices previously quoted.

CONNELLSVILLE

Furnace Coke Demand Slightly Increased—Wide Range in Prices.

Demand for coke continues extremely light, but there is possibly a slight im-

provement in furnace coke. The majority of operators are making no effort to run, feeling that such business as they could pick up would not afford them an economical operation. They lose money by being idle, but would lose more by operating, if exhaustion charges are included.

Sales in spot and prompt furnace coke show quite a range. One operator has been making particularly low prices, $3.50 and prabably $3.30 or $3.25, while some small lots have sold at $3.75. The furnace at Yorkville, which recently bought at $3.50 with the announced intention of putting its by-product plant in operation, is in the market again for Connellsville coke, for 30 or 60 days. A steel interest at Canton, on the other hand, has decided not to buy pig iron but to start its blast furnace and byproduct plant instead, and has bought some Connellsville coke around $3.50.

The *Courier* reports production in the week ended April 23 at 26,440 tons by the furnace ovens, and 25,140 tons by the merchant ovens, making a total of 51,580 tons, an increase of 4,360 tons.

UNIONTOWN

Slightly Increased Production — Prices Have Wide Range — New Demand Developing.

The disposition on the part of a few independent coke operators to make attractive prices to the few buyers in the market has not met with general favor, most operators continuing their quotations at "dead-line" prices for all grades of coal and coke. The result has found two quotations in the market, with most sales being made at the minimum. Furnace coke has been sold at $3.50, with most operators, however, quoting $3.75 and $4. Likewise the minimum foundry price is $5.25 with other quotations ranging $5.50@$5.75. Steam coal is $1.60@$2 and byproduct $2.25@$2.75.

The Washington Coal and Coke Co. has resumed operations after two weeks' suspension, during which time the mine pumping system was changed to an electric drive. The plant resumed at the lower wage scale.

Slight production increase both on the part of furnace and merchant ovens is taken to mean that the downward trend has finally hit bottom. At scattered points, preparations are being made to increase production to meet a demand which has developed during the past ten days, which, however, is neither large nor of a permanent nature.

CENTRAL PENNSYLVANIA

No Increase in Demand — Better New England Market Seen — Reduced Independent Costs.

Up to the present time there has been no material increase in demand expected from the export trade due to the strike in England. Operators have signed but few contracts with the railroads, the carriers being content to buy on the spot market while some coal is being secured from old shippers with the understanding that the price will be agreed upon later. The railroad fuel situation is more uncertain now than for many years.

Operators who have contracts with the United Mine Workers are seriously handicapped, as they cannot compete with the independent mines. Thirty-five operators in the field employing non-union miners have reduced wages to the 1917 scale of $1.01 per gross ton for pick mining and $5 a day for day men.

EASTERN OHIO

Railroad Fuel Production Declines—Lakes Sluggish Pending Rates Adjustment—Some Contract Closings—Spot Prices Weak.

Production declined sharply during the week ended April 23, registering a decrease of 22,000 tons, and 14,000 tons under the weekly average output since Jan. 1, which average approximates 288,000 tons. Production amounted to 274,400 tons or about 44 per cent of the aggregate weekly potential capacity of 630,000 tons.

The two important factors said to account for these declining operations are: First, that output for railroad fuel was less than for any week in many months; and, second, shipments of Lakes coal have been seriously hampered by lack of tonnage offering and disposition on the part of Lakes shippers to hold off, pending the adjustment in rail rates on cargo coal. The scarcity of tonnage has resulted in several thousand cars of coal being held under load at docks and on the lines.

Operations will be further curtailed because of the factors already named and the further fact that there is no perceptible improvement in the demand for steam coal.

It is reported that the D. L. & W. R.R. has just closed for 300,000 tons of No. 8 coal for the year beginning May 1 at a price understood to be $3. As this will be the first time this line has ever used soft coal as fuel one may wonder what will become of "Phoebe Snow" who has traveled this "Road of Anthracite" these many years.

Some small contracts are now being closed, but the larger number of buyers continue in the spot market. If anything, prices are not very firm, ranging about as follows:

Slack	$1.80@$2.00
Mine run	2.15@ 2.25
¾-in. lump	2.40@ 2.60
1¼-in. lump	2.50@ 3.00
Domestic lump	3.10@ 3.40

UPPER POTOMAC

Demand Unimproved — No Contracts Made, as Producers Await Spot Market Revival.

Demand is unimproved and consequently few mines are in operation, production being confined to the larger plants along the Western Maryland. There was no activity in the contract market during the week ended April 23, in fact, smaller producers were adhering to their policy of waiting for a revival of the spot demand instead of disposing of their output under contract.

FAIRMONT AND PANHANDLE

Better Market Outlook—Contracting Lags—Steam Demands More Active.

FAIRMONT

There was a slight increase in production in northern West Virginia during the week ended April 23, although market conditions were much the same. A somewhat larger tonnage moved on the bargain prices being offered, and there was a little better renewal of contracts. However, railroads were still refraining from contracting and it is expected that not much will be done along this line until June. Lakes shipment was at a minimum, pending the adjustment of freight rates. Tidewater shipments were slightly increased, with a better demand.

NORTHERN PANHANDLE

There was a general absence of contract activity and beyond a small volume of railroad tonnage the mines had little work to do. The fact that steel companies were resuming operations is counted on to stimulate production to some extent.

Middle West

MIDWEST REVIEW

Domestic Prices Increase — Demand Improves — Steam Still Inactive—Predicted Freight Reductions Restrict Buying.

During the last few days of April there developed a fairly satisfactory domestic market. This improvement was brought about very largely by the fact that prices advanced May 1. Franklin County prepared coals were increased 20c. This differential has been brought home to the retailers and there was a rush of orders on the $3.65 basis for prompt shipment.

The main problem which is now confronting operators is the sale of steam coal. Some profess to see an improvement in the industrial situation but the consensus of opinion is this is just about as bad today as it was in February. Those with storage facilities are placing their steam coal on the ground and shipping domestic sizes to the trade in the Middle West.

A careful inquiry into the state of mind of the average coal man reveals the fact that he is very much more hopeful today than a month ago, although there has been no material increase in the tonnage sold or in the prices obtained. Sales agents now realize that a very strong boom market is fast heading for the coal industry. The country has wasted so much valuable time, and the coal tonnage required is so far behind normal that when the demand comes it is going to come without warning and like an avalanche.

A Franklin County operator told us that for the first time since early in January he did not receive the number

of cars he ordered, apparently because the railroads did not have the cars to furnish, not through any accident or through blockading on the line, but because all the coal cars available were in actual use.

The question of freight rates is assuming added importance in the eyes of the coal fraternity. A number of industries which have been in operation on a reduced basis the past months, have not been buying much coal, in fact, just enough to keep them running from day to day. Purchasing agents are putting off buying until freight rates decrease. Undoubtedly freight rates will decrease, but as soon as they do, these agents will rush in and place orders with a natural result of boosting the market on steam grades. The wise man is purchasing his coal now, as he realizes that the decrease in freight rates will be more than wiped out by the increased market prices of coal after the new rates go into effect.

WESTERN KENTUCKY

Prices Softer—Retail Buying Movement Is Not Taking Hold—Contract Quotations Show Strength.

There is some movement of nut coal south, and a little demand for mine run. Lump is moving slowly as the buy-early movement is not making much headway. Screenings prices are holding up fairly well, and demand is taking care of production.

Leading operators are getting up to three days a week. There is some little demand for railroad fuel, and some movement to retailers, with the bulk of the business just now in Kentucky, southern Indiana and the South, the Northern movement being rather quiet.

Principal quotations show lump, $2.60; nut, $2.40@2.45; mine run, $2.10; nut and slack, $1.90@$2; pea and slack, $1.80@$1.90. Some spot coal is selling at prices as much as fifteen or twenty cents under, where operators have overproduced orders in hand. Some operators are asking $2.75@$3 for mine run on annual contract; screenings on contract are quoted $2@$2.50.

SOUTHERN ILLINOIS

Carterville Prices Increased—R.R. Tonnage Is Heavier—Domestic Movement Makes Steam Sizes Drag.

A better domestic demand has developed in the Carterville field. Nut coal is moving slowly and screenings are dragging. The mines shut up about two or three days a week at present, which is an improvement of about one day from last week. Railroad tonnage is still light. Circular prices increased to $3.85 on May 1 on all domestic sizes. The screenings market of $2.85 is being maintained fairly well. The independents, however, have screenings as low as $2.25, mine run at $2.50, nut $3, with lump and egg from $3.25 up.

In the Duquoin field the prices are somewhat on the scale of the independent Carterville operators and mines work about two days a week. Some railroad tonnage is moving now.

There has been a slight improvement in the Mt. Olive district. Steam sizes are heavy. Domestic is moving toward the Northwest and better than the average to St. Louis. Domestic prices increased on May 1 to $3. Steam sizes are quiet with the lagging market. In the Standard field there is little improvement, if any, except that more railroad coal is moving than heretofore.

Devoy & Kuhn Coal & Coke Co. of St. Louis got the Frisco contract for approximately 800 tons daily, 400 tons from the Illinois Fuel Company's mine at Sparta for the River and Cape Division of the Frisco and 400 tons from the Eldnor mine on the L. & N. for the St. Louis Division. The price is understood to be $2 for egg, nut and mine run. An order for the Rock Island of 750 cars, it is understood, has been completed. This was for mine run and the price was $1.80.

Steam sizes are unusually heavy. There is much screenings and nut coal unbilled. Several mines that have been idle for the last couple of months are not expected to resume before June 1. Prices are quoted in the Weekly Review.

Middle Appalachian

LOW-VOLATILE FIELDS

Production Increases—Good Bunkerage Call — Prices Unchanged — Contracts More Active.

NEW RIVER AND THE GULF

More regular production featured the week ended April 23 in the New River field, and growing out of a steady Tidewater demand. The coal so destined was for bunkerage, only a small proportion going for export. Prices have not yet responded to the increased demand. Virtually no tonnage was being consigned to the Lakes, with no prospect of such movement before late in May. A few contract closings were observed.

Gulf production also increased, mines averaging 40 per cent. The Inland West market furnished the best outlet and contracts were being placed on a basis of $3.50. Tidewater demand continued weak with prices $6@$6.25 at piers.

POCAHONTAS AND TUG RIVER

Pocahontas output increased to 200,000 tons, although "no market" losses still amounted to more than 50 per cent. Bunkerage demand led to a larger movement of coal. Spot sales were gaining but most of the coal was being disposed of by agencies and it was rather difficult to get a line on spot markets insofar as it affected conditions in the field. Contract making was somewhat more lively.

A slight gain was made in Tug River production due to a better Tidewater demand for bunkerage. A few new contracts were being made but producers are inclined to wait for higher prices before closing. The spot market showed signs of gathering strength, although prices remained unchanged.

HIGH-VOLATILE FIELDS

Thacker Labor Disturbance Recurring —No Market Losses Are Somewhat Less—Better Market Developing.

KANAWHA

Production remains at a very low ebb, with most of the mines closed down. Heavier inquiries have brought little actual business. However, when heard from, buyers were not demanding such low figures as recently, nor did they seem to expect such low prices. Shipments to Lakes were insignificant. There has not been any renewal of contracts on a large scale.

LOGAN AND THACKER

Logan producers had received orders which enabled them to increase their output to some extent during the week ended April 23 but the larger part of the tonnage was stored. More coal was going to the Lakes than to Tidewater but most of it for storage. Comparatively few contracts were being closed.

Although not seriously interfering with production, miners had resumed hostilities in the Thacker field to such an extent that there is a prospect that drastic action would have to be taken by state authorities to prevent open defiance of the law. "No market" losses amounted to about 140,000 tons and most of the coal shipped was being applied on contract.

NORTHEASTERN KENTUCKY

Few of the mines were in operation during the week ended April 23. Aside from the few companies which were producing contract coal, there was complete idleness in the region with an output of only 27 per cent. The Lakes market was inactive and no contracts were being made.

VIRGINIA

Only contract coal was being mined and production remained at about 50 per cent of capacity. This had the effect of keeping smaller mines out of operation.

West

UTAH

Conditions Are Poor—Stocks Not Being Replenished—Shortage Predicted.

The recent cool spell has passed off and conditions are now about the same as they have been for the past two months. The demand, such as it is, is coming from the domestic consumer, and even he is buying from hand to mouth.

Up to this week all the mines but one have managed to keep open, but market conditions have forced two or three to close during the past few days and coal men seem very pessimistic. Salt Lake City yards are fairly well stocked, but there is no coal in the country towns.

MINE And COMPANY NEWS

ALABAMA

The Monro-Warrior Coal Co. has completed extensive improvements at its Sterling mine, on the Black Creek Seam, near Nauvoo, Walker County, expending approximately $200,000 on mine and camp equipment, which includes a modern tipple, washing and screening plant, and a large number of dwellings for employees. Goodman short-wall mining machines have been installed in the mines. All equipment is electrically driven. Charles Blanchard is superintendent of the new Sterling operation.

It is reported that the **Central Iron & Coal Co.**, with pipe plant and byproduct ovens at Holt, Tuscaloosa County, and mines at Kellerman, has closed a tentative contract with the W. J. Oliver Co., of Knoxville, to begin stripping operations on a large tract of coal lands in Tuscaloosa County, from which it is expected to recover around 6,000,000 tons of coal. The Central Iron & Coal Co. is a subsidiary of the Central Foundry Co., extensive manufacturers of sanitary sewer pipe.

ALASKA

The Alaska Engineering Commission has awarded the contract for coal handling machinery in the government-owned mines of the territory to the Brinkley Co., of Seattle. All of the machinery is to be made at the plant of the company in South Seattle. The machinery is to be used for washing and grading of coal from the mines, the coal to be used by the navy and the new Alaska Ry.

COLORADO

Heirs of J. Pierpont Morgan are winners in litigation involving 10,000 acres of coal lands in Colorado and New Mexico held by the **Wooton Land & Fuel Co.** The U. S. Supreme Court sustained judgments obtained in the Delaware courts against Colonel J. A. Ownbey, of Boulder, for $200,000. Coal was mined for two years but at a loss. Ownbey, as vice-president and general manager, controlled the affairs of the company, even after the death of Morgan in 1913, to which the Morgan heirs objected, according to the complaint. Ownbey resisted the Delaware law which barred him from appearing without furnishing bond for $200,000, and it was upon this action that the case went to the Supreme Court of the United States. The coal lands are in Las Animas County, Colorado, and Colfax County, New Mexico.

ILLINOIS

The new plant of the **Chicago, Wilmington and Franklin Coal Co.** in Franklin County, is planned on a huge scale. The contract for the shaft has already been let, and Allen & Garcia Co., engineers for the plant, are now working up the plans.

The exclusive selling agency of the **Victory Collieries Co.** mine at Tamaroa has recently been given to the **Keystone Coal & Mining Co.**, of Chicago. The Victory mine has been operated by its present owners for over two years.

INDIANA

Seeking to collect $5,781.06 alleged to be due from the city of Anderson on a contract for coal bought, William H. Albrecht and Paul N. Davidson, doing business under the firm name of the **Interstate Coal Co.**, filed suit in the Federal court in Indianapolis, asking $6,000 and costs. The petition alleges that during last summer the city of Anderson placed an order with the coal company for 600 tons of coal at a contract price totaling $11,927.28, on which it is alleged only $6,146.22 was paid.

KENTUCKY

Establishment of a mine rescue station in eastern Kentucky at Harlan or Pineville has been requested of the Bureau of Mines by Senator Richard P. Ernst and Representative J. M. Robsion, Kentucky. They were informed that a rescue car would be sent to Kentucky May 1, and that the establishment of a permanent rescue station would depend on recommendations of the car crew.

At Pikeville a $150,000 hospital building is to be erected by a new corporation backed by M. C. Justice, Pikeville; A. C. Bond, Ashland; Dr. Reed S. Johnson, Praise, Ky., and others. A fifty-bed institution will be erected. The new hospital is badly needed in that coal field.

NEW MEXICO

The White Mountain Coal & Development Co. is operating a coal property on leased tracts aggregating 3,600 acres near the town of Oscuro, Lincoln County, 128 miles north of El Paso over the El Paso & Southwestern Ry., and has already shipped to the El Paso market about six carloads of coal during the last month and a half. The company is incorporated at $200,000. Officers are: President, C. H. Gimbel; vice-president, V. E. Woods; secretary, Charles Culter; treasurer, C. A. Gimbel.

The La Joya Coal Mining Co., of La Joya, Socorro County, has filed articles of incorporation, giving its authorized capital stock as $50,000. The incorporators are Henry J. Miller, Alfe A. Swanson, Emma M. Swanson, La Joya; J. J. Mahan, El Paso.

OHIO

Suit in which he asks for $1,000,000 damages has been filed in the Jefferson County Court against the **Wayne Coal Co.**, of Pittsburgh, Pa., and ten individuals by B. F. Burkhart, living near Canton. Burkhart claims that he was deprived of options for and the profit he expected to make from the sale of these options on coal land in Stark and Tuscarawas counties. In April, 1917, he obtained options on 560 acres at Dundee, alleging that he opened negotiations to sell the options to the Wayne company and that while the negotiations were under way S. M. Dunbar, president, went to the owners and persuaded them to sell direct to the coal company. Burkhart alleges that Dunbar stated that the former lacked financial backing.

The Fulton Pit Car Co. has been chartered with a capital of $325,000 to manufacture mine cars and other equipment for mining. The incorporators are C. K. Myers, H. N. Myers, R. F. Myers, J. V. Dugan and D. Baughman.

The Big Coal Co., Akron, has been chartered with a capital of $100,000 to mine and sell coal in the Tuscarawas district. The incorporators are: J. B. Patton, H. A. Kinney, C. W. Patton, D. E. Heighberger and B. F. Hamlin.

Papers have been filed incorporating the **Utilities Coal Co.** and also the **Kanawha & Ohio Coal Co.**, two separate corporations, each with a capital of $10,000. The incorporators of the two companies are the same and are S. C. Smith, Leo Schaffer, Charles P. Wahn, Herbert Hannigan and J. C. Martin. The offices of both companies are in Columbus. The first-named concern will be a purchasing agent for public utilities and will not do any jobbing business. Officers of this corporation are: J. C. Martin, president; Herbert Hannigan, vice-president; Charles P. Wahn, secretary, and S. C. Smith, treasurer and general manager. The Kanawha & Ohio Coal Co. will do a jobbing business as well as handle the output from the mines of the **Laurie Coal Co.**, of Greendale, W. Va.; the **Columbia Coal Co.**, of Charleston, W. Va., and the **Claybank Coal & Mining Co.**, of New Lexington, O. Officers of this concern are Herbert Hannigan, president; J. C. Martin, vice-president; Charles P. Wahn, secretary, and S. C. Smith, treasurer and general manager.

The C. G. Blake Co., of Cincinnati, has filed a second suit against the Navy Department in the United States District Court in that city to enforce a price payment of $5.60 a ton for coal requisitioned in 1920 and the early part of 1921. A first suit resulted in finding that the price asked by the company was reasonable and that the $4 offered by the navy was not reasonable. In the latest petition filed by the Blake company it sets forth six causes of action and avers that the government paid only $3 on account for this coal and that there is due a total of $21,073.20.

Quite an inducement is being offered the Cincinnati coal trade for its members to locate offices in the Dixie Terminal Building, recently opened, and which consists in locating the firms, at least as many as possible, on one floor. So far the following have quarters under lease on the eighth floor: **The Ohio & Kentucky Fuel Co., The Old Dominion Coal Corporation, The Semet-Solvay Co., The Riddle Coal Co., Thomas N. Mordue Co., Logan Pocahontas Fuel Co., M. A. Hanna & Co., The Interstate Coal & Dock Co., Elkhorn Piney Coal Mining Co.** On the sixth floor will be located the **Jewett, Bigelow & Brooks** offices.

The Pursglove Coal & Dock Co. has been incorporated with a capital of $30,000 to mine coal and ship the product on the Lakes. The incorporators are Joseph Pursglove, William McCaw, C. F. Taplin, C. N. Fiscus and M. E. Balcom. The offices will be located at 1414 Kirby Bldg.

The Tyrone Coal & Mining Co. has been chartered with a capital of $72,000 to mine and sell coal. Incorporators are Robert T. Salvage, Peter Ingham, John Ingham, Charles B. Hunt and Mary M. Hunt.

OKLAHOMA

Representative Snyder, N. Y., chairman of the House Indian Committee, has introduced a bill for the sale of coal deposits of the Choctaw and Chickasaw Indians in Oklahoma, and applying the coal and oil leasing law to unallotted Indian lands.

PENNSYLVANIA

W. J. Rainey & Co., Inc., has closed its Pittsburgh office and appointed the **Bixler Coal & Coke Co.**, of Pittsburgh, as exclusive sales agents for Rainey foundry coke in the States of Michigan, Ohio and western Pennsylvania.

Efforts to have all the coal companies operating in the city of Scranton pay their 1920 coal taxes promptly and to establish the future collection on the basis of the full market value were made recently by the city in filing municipal liens totaling $13,052.51 against the four following companies: **Delaware, Lackawanna & Western Co., Scranton Coal Co., Pennsylvania Coal Co.**, and **Leggett's Creek Anthracite Coal Co.** It is the contention of the companies that inasmuch as the surface property is assessed at 75 per cent of its market valuation the same should apply to the coal, instead of the latter being assessed at 100 per cent.

Repairs to property damaged by mine cave-ins during the last two years have cost coal mining companies in Scranton nearly $400,000, although the average value of the properties has been only about $5,000. The report of the mine cave commission, just made public, shows that 667 homes have been repaired at a cost of $368,706 and that $17,797 was spent in highway repairs.

Conditions in the Connellsville coke region are about the same as for the last few weeks. There have been increases in work in a small way in spots, but this is offset by some decreases, the net result being about the same.

TEXAS

The Huddleston Mining Co. has been organized at Belton for the purpose of mining coal and lignite. The company is capitalized at $200,000 and the incorporators are: H. F. Hannold, R. R. Huddleston and J. E. Palm.

UTAH

The Carbon Fuel Co., Salt Lake City, has been granted permission by the State Securities Commission to sell bonds in the amount of $101,000. The money will be used to open up new coal properties in Carbon County.

The Salina Canyon Coal Co. has been formed with a capital stock of $10,000.

WEST VIRGINIA

In order to insure a supply of fuel at all times in that particular section the Baltimore & Ohio has acquired a mine on the Connellsville Division of the road near Catawba, this mine having formerly been the property of **Andrew Lyons**, of Fairmont, and his associates. The coal is in the Pittsburgh seam. Until the mine was acquired by the B. & O. the owners of the mine shipped coal by the river route but since the railroad has acquired it a chute has been installed, making it possible to load railroad cars.

After a two months' suspension of operations, mines of the **Bethlehem Mines Corporation** at Barrackville and Dakota resumed operations on April 11 on virtually a full-time basis, affording employment to about 450 men. The mines are a subsidiary of the Bethlehem Steel Corporation and the product will be shipped to the steel company's plants. The resumption does not especially reflect any improvement in the steel business, the Bethlehem company simply desiring to secure coal from its own mines. Other companies at whose plants operations have been resumed are the **Troll Coal Co.** on the Western Maryland and the **Buttermore mines** on the Monongahela Ry.

Improvements are being made at the plants of the **Verona Coal Co.**, operating near Wellsburg and of the **Eddy Coal Co.**, operating near Oakmont in Mineral County. At both the plants houses are being built to make provision for more miners.

Capitalized at $325,000, the **Kenova Mine Car Co.** will engage in the manufacture of mine equipment of all kinds, including mine cars, the plant of the company to be located at Kenova point, where the company will also establish a foundry.

Grafton people have organized the **Adelaide Coal Co.**, with a view of engaging in mining operations in Taylor County, not far from Grafton, where the general headquarters of the company will be. The concern is capitalized at $25.000. Conspicuous in the organization of the company were: William P. Samples, N. F. Kendall, V. R. Kendall, A. Samples and Ole E. Wyckoff, all of Grafton.

Connellsville capitalists have launched the **Clearwater Coal Co.**, headquarters of which are at Fairmont, this company being organized with a capital stock of $250,000. Interested in the new corporation are: C. E Wilson, A. B. Kurtz, J. C. Henry, W. L. Wright and David Wertheimer, all of Connellsville, Pa.

A preliminary organization of the **Eddington Coal Co.** has been effected by Wheeling business men, this concern having a capital stock of $50,000. It will undertake the development of mining property in the vicinity of Wheeling. Leading figures in the new corporation are: Harry Dornan, Harvey H. McDonald, Harry H. McDonald, Harry Davis and E. E. Sells, Wheeling, W. Va.

Mine and mill supplies will be handled by the **Beckley Coal Supply Co.**, newly organized, this company having a capital stock of $50.000. Among those behind the new concern are: B. B. Richmond, of Cranberry; W. C. Thurman, of Beckley; Fred Richmond, of Pemberton; G. E. Harvey and J. M. Bowman, of Sprague.

Operations have been resumed by the **E. L. & W. Coal Co.** at its plant on the Monongahela Ry.

ALBERTA

Large coal deposits west of Edmonton will be developed by Scottish capital in the very near future. It is the intention of the **Lucar Collieries**, under which name the new firm will be known, to confine their development work to the Mountain Park region, and if preliminary surveys warrant more extensive development will be undertaken.

BRITISH COLUMBIA

The British coal strike has resulted in at least one big order for coal for shipment from Vancouver to Great Britain's customers. **D. Thomas & Co.**, coal exporters, have contracted for the shipment of seven cargoes of Vancouver Island coal to South Africa. The order was placed through a Welsh firm and only awaits cable confirmation for the first cargo to go forward.

NOVA SCOTIA

The case of McIntyre vs. the **Dominion Coal Co.** was completed in supreme court recently, the jury returning a verdict in favor of the plaintiff allowing damages of $500. The suit was brought against the company to recover for damages caused property of the plaintiff by subsidence of ground on which it stood caused by the company's underground workings.

Traffic News

The I. C. C. has authorized railroads to continue rates on coke from points in Alabama to points in Texas without observing the long and short haul clause.

In the complaint of the **Citizens Coal Mining Co.** an I. C. C. examiner recommends that rates on bituminous coal from Citizens Mines A and B in the Springfield, Ill., district on the Chicago, Peoria & St. Louis R.R., to Springfield, to various intrastate and interstate points, are not unreasonable.

In the complaint of the **Charleston (S. C.) Mining & Mfg. Co.** an examiner recommends that the rates on coal from points in Virginia and Kentucky to the Charleston company were applicable.

The cases of the **Peerless Coal Co.**, of Illinois, and the **Jones & Adams Coal Co.** are assigned for oral arguments before the commission in Washington on May 12.

The Coal Trade Bureau of Illinois has been allowed to intervene in the case involving rates on bituminous and cannel coal from Ohio, Pennsylvania, Maryland, Virginia, West Virginia, Kentucky and Tennessee to points in the lower peninsula of Michigan.

The Kaw River Sand and Material Co., of Kansas City, in a complaint attacks as unreasonable the rates on coal between points of origin within 1,000 miles of Kansas City and its plants at Turner, Kansas.

The Canton (Ill.) Coal Co. in a complaint to the I. C. C. attacks as unreasonable the rates on bituminous coal from the mine at Rawalt, near Canton, to St. Paul, Minn.

The Hercules Motor Co. of Canton, Ohio, attacks as unreasonable the rates on coke from Detroit to Canton.

In the case of the **Missouri Pacific Ry.** against the **McGrew Coal Co.** from the Missouri Supreme Court, effort was made to set aside a judgment in favor of the coal company for refund of excessive freight rates on the ground that the shipper did not pay the overcharges. The action was brought by a shipper under the long and short haul law of Missouri and judgment for overcharges was given by the Missouri courts. The railroad brought the case on writ of error to the Supreme Court, contending that the law as construed violated its constitutional rights. In an opinion by Justice Brandeis the court holds that the only federal question which was substantially and properly raised in the courts below was decided adversely to the railroad's contention in a similar case involving similar transactions. The court holds that the objection that the shipper did not pay the freight charges and was not damaged raises no substantial federal question but is a question of State law, which the Supreme Court has no jurisdiction to review.

Black Mountain Railroad Co., a short-line feeder operating in the coal field of Bell and Harlan counties, in amended articles of incorporation just filed, provides for an increase of capitalization from $200,000 to $500,000.

The McKell Coal & Coke Co., of Glen Jean, W. Va., complain against unreasonable rates on semi-bituminous coal from its mines in West Virginia to various interstate destinations.

At Washington on May 14 the commission will hear the complaint of the **Duquesne Coal & Coke Co.**, and on May 16 the complaint of the **Hillsboro Coal Co.**

The Comptroller of the Treasury has refused a claim of the New York, New Haven & Hartford R.R. for payment of shipments of coal from Scranton, Pa., to New Bedford, Mass. The company says it was misinformed as to the point of origin of the shipment in question. The comptroller rules that it was the duty of the Delaware, Lackawanna & Western R.R. in the absence of specific through routing by the shipper to route the shipment via the cheapest reasonable route. He says there were two routes out of Scranton at the rate of $3.30 a ton which was well known to the D. L. & W., and that the railroad routed the shipment on the higher rate for its own convenience, and that the routing via the longer route cannot operate to increase the charges to which the shipment was lawfully entitled. The comptroller says the statement of the railroad that the adjustment of the excess charges should be between the government and the **Peoples Coal Co.** does not have merit.

The complaint of the **Fairmont & Cleveland Coal Co.** has been assigned for oral argument before the I. C. C. in Washington on May 21.

In the complaint of the **Merchants' Coal & Coke Co.** an I. C. C. examiner reports that the rates on lump coal from Eldnar mine and Cantine, Ill., to Rose Hill, Ill., and from Cantine to Jefferson Park, Ill., are not unreasonable.

In the complaint of the **Burns & Hancock Fire Brick & Clay Co.** an examiner recommends that the rates on shipments of mine run bituminous coal from mines in the Clinton, Ind., district to West Montezuma, Ind., are not unreasonable.

Poehlmann Bros. Co. and others, of Morton Grove, Ill., in a complaint to the commission, attack as unreasonable the rates on coal from mines in central and southern Illinois to Edgebrook and Morton Grove.

The commission has decided that the rates on bituminous coal from Belleville, Benton, Duquoin, Murphysboro and other southern Illinois points to Springfield, Mo., via routes in connection with the St. Louis-San Francisco R.R., are unreasonable, and that the rates on bituminous from Quinnimont, W. Va., and Lilly, Pa., to Springfield, Mo., are not unreasonable.

The I. C. C. has authorized the **Union Coal & Coke Co.** to intervene in the case of the Lackawanna Steel Co.

Senator Calder has introduced a bill to prevent the I. C. C. from issuing priority orders in advance of hearing thereon.

The Salt Lake & Utah Ry. has applied to the State Public Utilities Commission for the privilege of delivering coal in Salt Lake City on exactly the same terms as the other railroads. This would enable the company to haul coal to Salt Lake destined to consignees whose tracks connect with the Rio Grande or the Salt Lake Route, as well as to those consignees whose plants are situated on spurs of the St. L. & U. R. Co. At the present time the tariff of the company contains a clause reading "Rates applicable only to traffic delivery on the team tracks of the Salt Lake and Utah railway or to industries served by it when so routed by shipper."

Oral arguments have been assigned in coal cases before the I. C. C. at Washington as follows: **West Kentucky Coal Bureau**, May 18; **Reeves Coal & Dock Co.**, and the **P. Koenig Coal Co.**, May 19.

In a complaint to the commission the **Terre Haute, Indianapolis & Eastern Traction Co.**, of Terre Haute, Ind., attacks as unreasonable the rates on bituminous coal from producing points in Indiana to Terre Haute, and asks refund of $29,652 as overcharges on former shipments.

Michael S. Goss and others, of Auburn, N. Y., complain against unreasonable rates on anthracite coal from producing points in Pennsylvania to Auburn and other New York points.

In the complaint of the **Cameron Coal Co.**, an I. C. C. examiner recommends as follows:

"Refusal by the Chicago, Burlington & Quincy R.R. Co. to serve complaining coal companies' mines located on the rails of the Marion & Eastern R.R., whereas it serves coal mines located on the rails of the Missouri Pacific R.R., at Royalton, Ill., and on the rails of the Illinois Central R.R., at Logan, Ill., not found to be unduly prejudicial.

"Not shown that the public interest would be served by the construction of a physical connection between the rails of the Chicago, Burlington & Quincy and the Illinois Central at a point two miles west of Marion, Ill.

"Not shown that public convenience and necessity require the extension of the rails of the Marion & Eastern to connect with the rails of the Chicago, Burlington & Quincy at a point about two miles west of Marion; or that such connection is reasonably practicable or would produce sufficient business to justify its construction and maintenance.

"In view of the above findings no reason exists for an order requiring the Illinois Central to permit any additional use of its rails by the Marion & Eastern.

"Complaint dismissed."

Personals

T. R. John, general manager of the Bethlehem Mines Corporation, with headquarters at Reedsville in Preston County, was a business visitor at Fairmont, W. Va., early in April.

Recent visitors in the Cleveland market were **Guy Hartley** and **M. L. Taylor,** of the Morgantown Coal Co., with headquarters at Morgantown, W. Va.

Benjamin Bissell, general manager of the Century Coal Co., having headquarters at Baltimore, paid a visit to the company's mines at Century, Barbour County, and also to the Fairmont region early in April.

J. J. Ross, former president of the Logan Operators' Association, with headquarters at Logan, was a visitor in the Kanawha region during the early part of April.

George Wolfe, secretary of the Winding Gulf Operators' Association, and a director in the Tug River Operators' Association, has been elected a member of the county court of Raleigh County to succeed one of the commissioners removed. The appointment is regarded as an excellent one, as Mr. Wolfe has already devoted much time to public service and has always made a splendid public official.

J. C. McKinley, of Wheeling, president of the Richland Coal Co., has returned to his headquarters at Wheeling after spending some time in the capital working on tax matters affecting the state in general.

George B. Taylor, general manager, and **J. S. Amend,** auditor, of the Jamison Coal & Coke Co., both with headquarters at Greensburg, Pa., were visitors in the Fairmont region the latter part of April.

A recent visitor in the Baltimore market was **F. J. Patton,** of the Patton Coal Co., of Fairmont. Mr. Patton made the trip in a machine, having members of his family with him.

Jack Lewis, sales manager of the Buffalo Coal & Export Corporation, with headquarters in New York, spent a few days during the latter part of April at the general offices of the company in Huntington, W. Va.

B. L. Priddie, of Huntington, who is president of the Elkhorn Collieries Co., operating in Kentucky, spent a few days during the latter part of April at the company's plant in Kentucky.

L. C. Sherrill, for the past few years with the Lumaghi Coal Co., at St. Louis, has resigned his position to accept a similar one as general sales manager for the West Virginia Coal Co., of St. Louis. Mr. Sherrill succeeds **J. J. O'Donnell,** who has been with the West Virginia Coal Co. for a number of years.

W. A. Brewerton, president of the Sangamon County Mining Co., of Springfield, Ill., is in the hospital, having undergone an operation for stomach trouble.

Charles A. Owens, president of the Imperial Coal Co. and the Tidewater Coal Exchange, Inc., of New York, was a visitor recently at the Norfolk offices of his company.

W. A. Shea, manager of the Norfolk branch of Cosgrove & Wynkoop, went to New York recently to visit headquarters and to make an informal survey of conditions in the New York market.

J. G. Miller and **J. R. Christian,** of the Raleigh Smokeless Fuel Co., have been in New York calling on the trade.

E. W. Scheer has been made general manager of eastern lines of the B. & O., to fill the vacancy made by the resignation of Stanton Ennes on Jan. 1. **R. B. White,** formerly superintendent of the Baltimore division, succeeds Mr. Scheer as general superintendent of the Maryland District with headquarters at Baltimore. **F. G. Hoskins** has been superintendent of the Baltimore Terminal Division, to succeed Mr. White as superintendent of the Baltimore division.

The Bureau of Mines has appointed **L. F. Lumaghi** president of the Fifth and Ninth District Illinois Coal Operators' Association, as general chairman of the committee on arrangements for the Bureau's first aid and mine rescue meet at St. Louis next September. **W. K. Kavanaugh,** of the Southern Coal & Coal Co., has been appointed chairman of the program and arrangements committee.

J. B. Eby and **M. R. Campbell,** of the Geological Survey, are conducting field investigations in the coal regions of Wise and Russell counties, Virginia.

H. Clyde Elkins, mine inspector, of Connellsville, is taking a business and pleasure trip through the Southern States, including Tennessee, Virginia, Maryland and Georgia. While in Georgia he will inspect the old Durham mines where state convict labor was employed for years.

Director George Otis Smith, of the Geological Survey will address the convention of the Indiana Retail Coal Merchants' Association on May 6.

Edward J. Hackett, who has been seriously ill at his home for the past several days, is reported to be improving. Mr. Hackett is a prominent producer of Indiana and has retailing and jobbing connections in Louisville and New Albany.

A. H. Land, president of the Dickinson Fuel Co., of Charleston, was a recent visitor in Eastern markets.

W. F. Coale, president of Coale & Co., of New York City, has returned to his headquarters after spending several weeks in the Kanawha and New River regions.

Arthur F. Rice, commissioner of the Coal Merchants' Association of New York, who has been ill since January, has recovered sufficiently to be taken to California to recuperate.

Ezra Van Horn has been appointed general manager of the Clarkson Coal Mining Co., Cleveland, Ohio, vice **C. P. White,** resigned.

K. Baumgarten has been appointed as a mining engineer of the United States Bureau of Mines, attached to the Mississippi Valley Station at St. Louis, Mo. Mr. Baumgarten's professional experience embraces a period of some fourteen years spent in operations and examinations in this country and in Mexico.

Joseph J. Traher has resigned his position as mine superintendent of the Union Pacific Coal Co., in Wyoming, after twenty-two years of service, assigning ill health as the cause. He will take a long rest, going to Wilkes-Barre, Pa., where he will visit relatives.

Howard M. Raymond has been appointed acting president of the Armour Institute of Technology, to fill temporarily the vacancy caused by the recent death of Dr. F. W. Gunsaulus.

George P. Daniels, vice-president of the Smokeless Fuel Co., formerly located in Cincinnati, but now in charge of the New York office, visited the former city while on a Western trip and renewed old acquaintances.

Industrial News

Beckley, W. Va. — Secretary George Wolfe, of the Winding Gulf Operators' Association, has announced the opening of the new offices of the association in the Bair Building.

New York, N. Y. — Lima Locomotive Works, Inc. has removed its executive and sales offices from 30 Church St. to the National City Building, 17 East 42nd St.

New York, N. Y.—The Combustion Engineering Corporation announces its removal to its new building, Combustion Engineering Building, 43-45-47 Broad Street.

Chicago, Ill. — Roberts & Schaefer Co., engineers and contractors, announce their removal from the McCormick Building to the eleventh floor of the Wrigley Building.

Association Activities

West Kentucky Coal Bureau

The coal bureau held its regular business meeting in Birmingham on April 15. The bureau, which has no connection with the price or marketing of coal, but devotes its attention to matters of conservation, production and safety and welfare work, represents about ninety per cent of the tonnage produced in western Kentucky. Papers were read before the meeting on "Traffic," by C. F. Richardson, president of the Kentucky Coal Co.; "Conservation and Safety," by Edward Holt, Central City, Ky.; "Preparation and Cleaning of Coal," J. L. Rogers, president and general manager Rogers Brothers Coal Co., Pevier, Ky.; "Cost of Production," Monro B. Lanier, Birmingham, Ala., who operates the Norton Coal Co., in the Kentucky field. At the conclusion of the business sessions the visitors were tendered a banquet by a committee of Birmingham coal men, Monro B. Lanier, Morris Bush, George W. Connors, W. C. Adams, C. S. Bissell and S. L. Yerkes, and later visited industrial plants and mines in the district.

Obituary

James Stewart, superintendent of the Tennessee Coal, Iron & Railroad Co.'s Blocton division, died at Blocton April 18 as a result of an attack of heart trouble. Mr. Stewart was well-known and generally liked in mining circles and rose to the superintendency of the Blocton mines from the ranks, starting in as a greaser boy, having had supervision of these operations for several years.

William P. Plant, an official of the Midland Lumber & Coal Co., Minneapolis, operating a line of lumber and coal yards, died recently after an illness of several months.

Philip Groben, formerly a coal dealer of Buffalo, N. Y., under the name of Groben & Groben, died recently at his home in Long Branch, N. J., at the age of 69. He did a large coal business, but was perhaps better known as a raiser and trainer of fine horses.

Coming Meetings

Due to the impossibility of securing hotel accommodations for the annual meeting of the **Kentucky Retail Coal Dealers Association,** at Lexington, April 27, Secretary J. Crow Taylor, advises that the meeting has been postponed until May 11 and 12.

Mine Inspectors' Institute of America will hold its twelfth annual meeting at Charleston, W. Va., July 12 to 15. Secretary J. W. Paul, Bureau of Mines, Pittsburgh, Pa.

Illinois and Wisconsin Coal Dealers' Association will meet at Chicago, Ill., July 13 and 14.

Missouri State Retail Coal Merchants' Association will hold its annual meeting at the Planters Hotel, St. Louis, Mo., May 17 and 18. Commissioner E. J. Wallace, Pierce Bldg., St. Louis, Mo.

American Society for Testing Materials will hold its annual meeting at the New Monterey Hotel, Asbury Park, N. J., June 20 to 24. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Illinois Mining Institute will hold its spring outing the early part of June on the Mississippi and Illinois Rivers, the boat leaving St. Louis for Peoria on June 3 and returning on June 5. Secretary, Martin Bolt, Springfield, Ill.

The American Mining Congress and National Exposition of Mines and Mining Equipment. The 24th annual convention on Oct. 17 to 22 at the Coliseum, Chicago, Ill. Assistant secretary, John T. Burns, Congress Hotel, Chicago, Ill.

American Institute of Chemical Engineers will hold its spring meeting June 20 to 24 at Detroit, Mich. Secretary, Dr. J. C. Olsen, Polytechnic Institute, Brooklyn, N. Y.

The American Wholesale Coal Association will hold its annual convention in Washington, D. C., June 7 and 8. Secretary, G. H. Cushing, Woodward Bldg., Washington, D. C.

The International Railway Fuel Association will hold its thirteenth annual meeting at the Hotel Sherman, Chicago, Ill., May 24, 25 and 26. Secretary, J. G. Crawford, Chicago, Ill.

The National Coal Association will hold its next annual convention at the Waldorf Astoria Hotel, New York City, May 19 and 20. White Sulphur Springs hotel reservations have been cancelled. Secretary, W. B. Reed, Commercial National Bank Bldg., Washington, D. C.

The American Society of Mechanical Engineers will hold its spring meeting May 23, 24, 25 and 26 at the Congress Hotel, Chicago, Ill. Secretary, Calvin W. Rice, 29 West 39th St., New York City.

National Retail Coal Merchants Association will hold its annual meeting May 12, 13 and 14 at the Jefferson Hotel, Richmond, Va. Special rates on all railroads. Secretary, E. G. Gordon, Philadelphia, Pa.

Michigan-Ohio-Indiana Coal Association will hold its annual meeting June 15, 16 and 17 at Cedar Point, Ohio. Secretary, B. F. Nigh, Brunson Bldg., Columbus.

National Association of Cost Accountants will hold its annual convention at Cleveland, Ohio, Sept. 14, 15 and 16. Secretary, S. C. McLeod, 130 West 42d St., New York City.